The Three-Inch Anti-Aircraft Gun
Model 1918

Special Correspondence

IN DESCRIBING this gun the terms right and left, front and rear, etc., refer to the location of the parts assembled, and front is the direction in which the gun points. For the purpose of brevity in description the gun as described is assumed to lie with the axis of the operating shaft horizontal.

This gun is built up of nickel-steel forgings, consisting of a tube, jacket and breech ring as shown in Fig. 1. All of these parts are assembled by shrinkage. The tube ends at the rear end of the powder chamber; it has two recesses cut into its rear face to form seats for the toes of the extractors, and a shoulder at its rear end prevents forward motion in the jacket.

The jacket carries two flanges on its lower side which form part of the guide rails of the gun; a lug on the top near the forward end which contains a T-slot that holds the oil cylinder in place; the rear end is threaded on the outside to receive the breech ring. It is assembled over the muzzle end of the tube. The breech ring is threaded at its forward end and screws onto the rear end of the jacket; the beveled shoulder abuts against a shoulder on the jacket. The breech ring carries a recoil lug at the top for the attachment of the recoil piston rod, and another lug at the bottom that extends nearly the full width of the ring. This lug is used for the attachment of the counter-recoil rods and also forms a bearing and supports the operating shaft and lock plate. The upper rear portion of the breech ring is cut away to form a breech recess. A rectangular section is cut out of the breech ring to provide for the breech block. The entire breech mechanism is shown disassembled in Fig. 2.

THE 3-IN. (A-A) ANTI-AIRCRAFT GUN, MODEL 1918

WEIGHTS, DIMENSIONS, ETC.

Weight	1948 lb.
Caliber	3 in. (76.2 mm.)
Total length	129.69 in. (3294.126 mm.)
Length of bore	40 calibers, 120.04 in. (3049.016 mm.)
Number of grooves in rifling	24
Width of grooves in rifling	0.2874 in. (7.3075 mm.)
Depth of grooves in rifling	4.03 in. (0.762 mm.)
Width of lands in rifling	0.0992 in. (2.519 mm.)
Twist of rifling	Right hand increasing from one turn in 50 calibers at the origin to one turn in 25 calibers at a point 8.87 in. from the muzzle and uniform from that point to the muzzle.
Weight of projectile (shrapnel)	15.95 lb.
Weight of charge	5 lb.
Volume of chamber	200 cu.in.
Muzzle velocity	2400 ft. per second
Service pressure per square inch	33,000 lb.
Energy	599.7 ft. tons
Maximum pressure permitted	34,000 lb. per square inch
Travel of projectile	97.73 in.
Density of loading	0.692 in.

The Breech Block—The breech block *A*, Fig. 3, consists of a rectangular block of forged steel carrying two flanges on either side, which engage with corresponding grooves in the breech recess and lock the block to the gun. These flanges and slots are inclined at a slight angle to the vertical so that the block moves forward slightly in closing and forces the cartridge into its seat. The upper part of the block is cut away in a circular opening to permit the passage of the cartridge when the block is open. The front edge of this opening (which is at the back in the illustration) is beveled off so that if the cartridge is not seated when the block is closed this bevel will strike the edge of the case and push it home. A slot inclined at an angle to the front face of the block and having a T-shaped cross-section is contained in the lower part of the block. The T-shaped outer end of the operating arm *A*1, Figs. 2 and 4, works in this slot in raising and lowering the block. A slot in each of the side faces of the block forms a guide for the inside trunnion of the extractor on that side. The lower part of this slot is inclined slightly forward and the upper part curves sharply to the front, thus increasing the speed of the extraction during the final part of the downward motion of the block. The lug at the front of this slot is cut away at its upper end to form a horizontal surface, and the inner trunnions on the extractors are forced over this surface by the extractor plunger so as to lock the block in its open position. The firing-mechanism recess consists of a hole bored through the center of the block from the rear face to the front face and counterbored to the shape of the firing pin, a counterbore at the rear end of this hole is threaded to receive the faceplate and a counterbore at the front end is threaded to receive the vent bushing. A rectangular slot opening into one side of the firing-pin hole receives the hub of the cocking lever. A long, cylindrical hole extending from the bottom of the block through the above slot is for the trigger shaft, and a cylindrical hole from the left face of the block to the firing-pin hole is for the sear and the sear spring. This last hole is threaded at its outer end for the sear-spring seat and breaks through the front end of the firing-arm slot. A V-shaped recess in the lower face of the block with the apex at the trigger-shaft hole limits the amount of rotation of the trigger shaft and protects the firing mechanism from damage. A vent hole is drilled through the breech block from the operating-slide surface into the vent bushing to

allow the gases that follow the firing pin to escape. A hole is drilled and tapped in the upper face of the block for an eye-bolt used in assembling and disassembling.

The Lock Plate—The lock plate *B*, Figs. 2 and 3, is a forged-steel plate, the general outline of which incloses a hollow square that forms a recess which allows the breech block to pass through during the opening and closing of the breech. The plate fits on the lower side of the breech ring and is held in place by dovetail lugs and a rectangular draw key *X*. The front ends of the plate form a part of the bearing for the operating shaft and lock the shaft in place after assembling, as indicated in Fig. 2.

The Operating Shaft—This is a forged-steel shaft, *A*3, Figs. 2 and 4, in the center of which and integral

The Operating Handle—The handle *C*, Fig. 4, carries a lug *C*1 on the inside, just below the handle grip, which is engaged by a latch on the side of the gun holding the handle, and consequently the breech block, in closed position. The bottom end of the handle carries a hub which is broached out to fit a hexagonal section of the operating shaft.

The Extractors—The extractors *D*, Figs. 2 and 4, are two in number, right and left. They are flat, oblong steel drop-forgings. From each extractor there are three projections: First, a lip at the front part of the upper end of the extractor, which fits into the recess in the tube and bears against the front face of the flange on the cartridge case in extracting the case. Second, a trunnion on the outside of the lower portion of the ex-

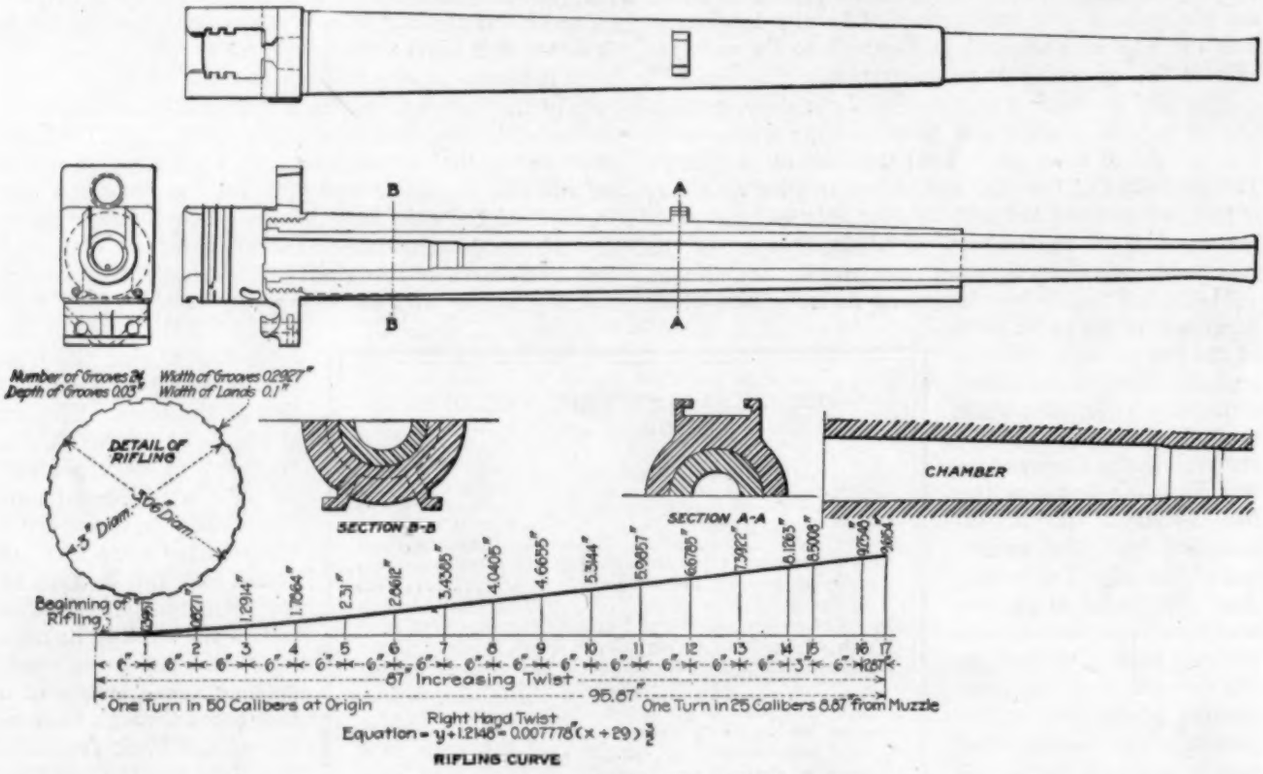


FIG. 1. GENERAL DRAWING OF THE GUN

therewith is an operating arm *A*1. At one end is a cylindrical flange that keeps the shaft from moving endwise. Next to this flange is a bearing surface composed of a bronze bushing *A*2. On the other end of the shaft is a hexagonal section for the operating handle *C*, and next to this a chain terminal lug *A*4 and another bronze bushing *A*2 that forms a bearing surface. The bronze bearings carry the weight of the shaft and breech block, and fit into a cylindrical bore in the bottom of the breech ring at right angles to the bore of the gun. The hexagonal section fits into a hole of similar section of the operating handle *C* and prevents rotary motion of the handle without a corresponding movement of the operating shaft. The chain-terminal lug is the means by which the action of the operating spring *H* is conducted through the operating shaft to the breech block. At the end of the shaft a small groove is cut to receive the operating-shaft detent *E*, Fig. 2. The top angle of the hexagonal section is flattened off to prevent the handle being assembled in any but proper position.

tractor, which moves in a recess in the wall of the breech recess and against which the extractor plunger gears; this plunger, which together with the plunger spring and plunger plug is carried in a cylindrical hole in the breech ring, tends to push the lower part of the extractor forward and has for its principal purpose the forcing of the inside trunnions on the extractor over the horizontal shoulder on the block in order to lock the block in the open position. Third, a trunnion on the outside of the lower portion of the extractor; this trunnion operates in the cam slot in the inside face of the breech recess and imparts the rolling motion to the extractor which extracts the cartridge case. A flat is cut on this trunnion to engage with the corresponding horizontal shoulder on the block in locking the block open.

The front surface of the extractor is curved, and as the block is opened the lower end of the extractor is forced forward by the trunnion, which fits in the inclined groove on the block, and the extractor rolls on

this surface, which bears against the vertical surface on the gun at the rear of the tube. By this method a variable leverage is obtained, giving greater power and less speed at the first part of the extraction and greater speed and less power at the final part of extraction.

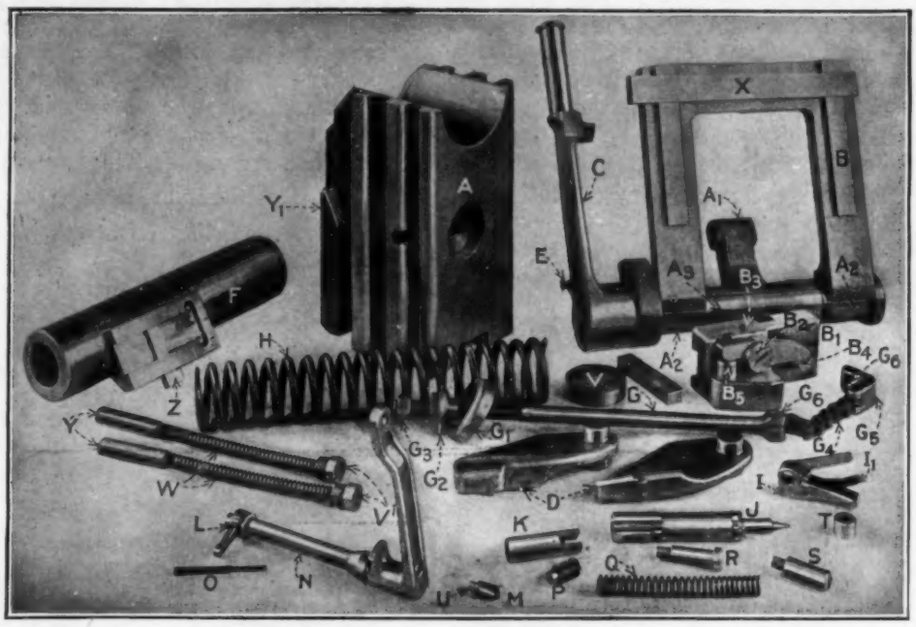


FIG. 2. ENTIRE BREECH MECHANISM DISASSEMBLED

The Operating-Shaft Detent—The operating-shaft detent *E*, Fig. 2, is a Y-shaped flat steel spring, the forks of which fit into the groove at the right end of the operating shaft and the outside of the operating handle hub. At the upper end of the detent is a conical pin which snaps into a hole in the handle, thus locking the detent in place.

The Closing-Spring Case—The closing-spring case *F*, Figs. 2 and 4, is a cylindrical hollow-steel casting with a lug on one side of which a dovetail is milled to fit over a corresponding lug on the right side of the gun. A rectangular slot at right angles to the dovetail passing through case and lug on the gun is provided for the insertion of a rectangular key *Z*, Fig. 2, having a taper on one side. The insertion of this key forces the case into position and locks it there. The case is bored out to receive the closing spring *H*, Figs. 2 and 4, and a shoulder is left at the rear end against which the spring bears.

The Spring Piston Rod—The closing-spring piston rod *G*, Figs. 2 and 4, passes through the center of the spring *H*, carrying at its front end the spring piston *G*1 which is held in place by the spring-piston rod nut *G*2. The piston-rod nut is held in place by the locknut *G*3. This rod is connected at its rear end to the chain terminal *G*4 and *G*5, Fig. 2, which furnishes a flexible connection between it and the operating handle.

The Closing Spring—The spring *H*, Figs. 2 and 4, is a helical spring, which has a free height of 14 in. and an assembled height of 10.6 in., and exerts a pressure of 310 lb. at assembled height. This pressure may be increased to the amount necessary to assure the closing of the block by screwing up on the piston nut *G*2, but should not be increased to an amount greater than is absolutely necessary to obtain this result, because unnecessary compression upon the spring causes the handle to strike an extra heavy blow on the handle stop. This is detrimental to the efficient working of the gun.

The Return Catch—The return catch *I*, Fig. 2, is pivoted on the left side of the breech end of the gun, and when the gun is out of battery it is held down by its weight and the action of the catch spring, which bears against the underside of the return-catch stop. When the return catch is the downward position the hook on its end is in line with a notch in the end of the firing shaft. If the firing shaft is moved to the rear when the gun is out of battery it will be caught by this catch, which prevents the firing of the piece. When the gun is in battery the hook on the catch is lifted out of line with the notch in the firing shaft by a cam on the firing-shaft bracket.

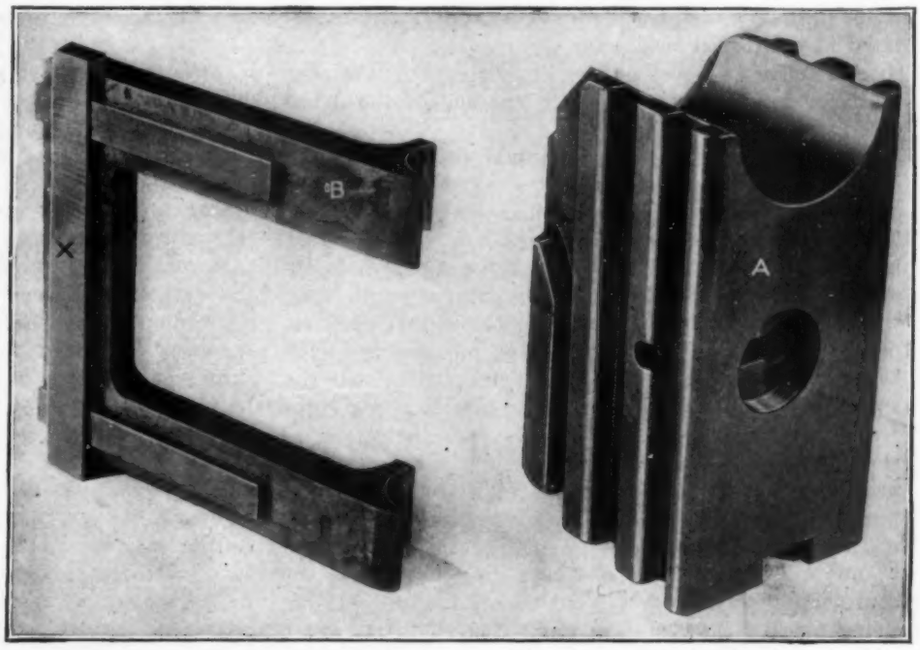


FIG. 3. BREECH BLOCK AND LOCK PLATE

The Firing Pin—The firing pin *J*1, Fig. 5, is a hollow cylinder carrying on its front end a small solid cylinder *J*, Figs. 2 and 5, terminating in a conical point which protrudes through the front face of the block when in the forward position and punctures the cap in firing. Two slots are cut on one side of the firing pin, one to receive the projection on the sear *M*, which engages the rear edge of the slot and holds the pin back until the sear is released by the action of the cocking lever *L*, and the other to admit the end of the cocking lever, which passes through and bears on the rear of the spring shoe. The rear end of this slot bears against the back of the cocking-lever arm when the pin is being returned to the rear position under the action of this arm. On the opposite side of the pin is a small slot into which the dowel pin on the spring shoe fits. This slot is provided with two right angled turns, which form a shoulder and lock the shoe in the firing pin until it is released by being rotated. The bearing surfaces on the exterior of the firing pin have grooves cut in them to prevent the formation of an air cushion in front of the pin.

The Firing-Spring Shoe—The firing-spring shoe *K* is a hollow cylinder which fits over the rear of the firing spring *Q* and slides inside the pin *J*1, Fig. 5. A dowel pin on the exterior of the shoe engages in a slot in the pin, and when rotated in position prevents the shoe from being forced out by the spring. At the rear of the shoe is a slot into which the end of the firing arm fits.

The Cocking Lever—The cocking lever *L*, Figs. 2 and 5, is a drop-forging consisting of a cylindrical hub with a projecting arm carrying a small knob at its outer end. The hub is provided with a square hole. The cocking lever fits in a slot in the block, and the square hole fits over a corresponding square on the trigger shaft *N* by which the arm is rotated. The outer end of the arm passes through the wall of the firing pin, and the knob bears on the surface at the forward end of the slot in the spring shoe. The cocking lever also carries a small projecting shoulder which engages a corresponding shoulder on the sear when the arm is rotated to the proper position and releases the sear from the firing pin.

The Sear—The sear *M* is a small steel cylinder open at one end to receive the sear spring *U*. It carries a projecting shoulder which engages in the notch in the firing pin and a second shoulder on which the shoulder of the cocking lever operates in releasing the sear. The sear and sear spring are carried in a cylindrical recess in the block which opens into the hole containing the firing pin.

The Trigger Shaft—The trigger shaft *N* is a cylindrical shaft carrying a square on one end which fits into the cocking lever and a flat arm projecting at right angles from the other end which serves to rotate the shaft. The shaft also carries at right angles a small lug which fits into a recess in the bottom of the breech block limiting the travel of the trigger shaft and serving as a safety device against injury to the firing mechanism.

The dismounting and disassembling of the breech mechanism is accomplished by inserting an eyebolt in the top of the breech block, this eyebolt serving to take the weight off the block. Remove the trigger-shaft detent and pin and then remove the trigger shaft.

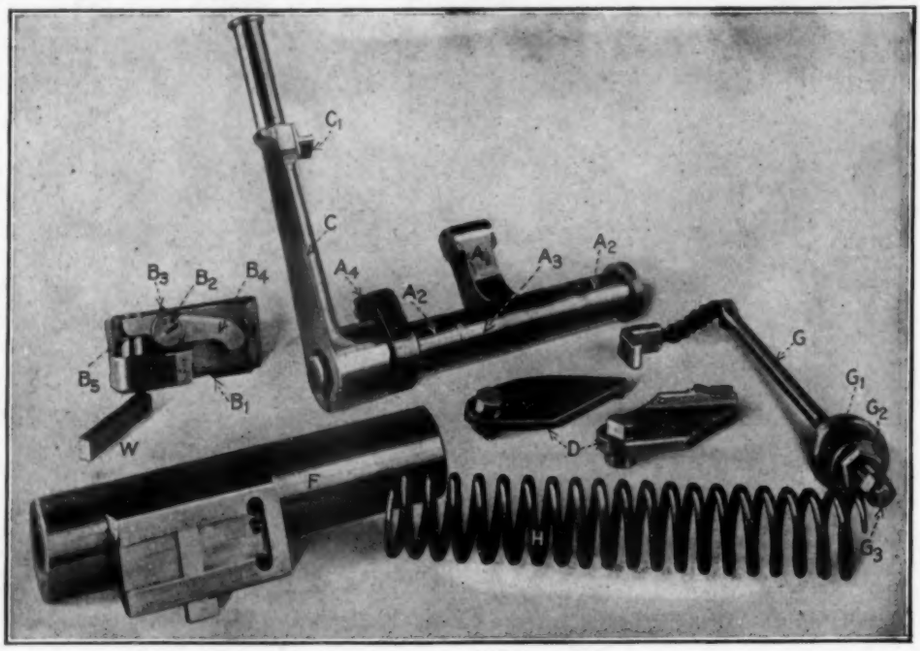


FIG. 4. OPERATING MECHANISM

Remove the lock-plate key and remove the lock plate by pulling toward the rear of the gun. Remove the tension on the closing spring by loosening the closing-spring nut; disconnect the chain from the chain terminal by pulling out chain-terminal link pin. Remove the operating handle by pulling out on the knob of the detent, thus disengaging the detent from the shaft. Be sure that the full weight of the block is being held by the eyebolt or lifting bolt screwed into the top, then lift the operating shaft up and out toward the rear of the gun. This frees the block so that it can be lowered through the breech recess. The closing-spring case can be removed by pulling out the key and sliding the case toward the muzzle end of the gun. The closing-spring piston rod, etc., are then removed from the case. The extractor plungers and springs may be removed by unscrewing the two plugs. Great care must be exercised in removing these plugs because the plunger springs are in compression, and when the last turn on the plug releases the spring the plugs will be thrown to the rear with considerable force and personal injury may result therefrom. There is also danger of the plugs being lost. After the springs have been removed the extractors can be lifted out of their bearing inside of the breech recess.

Disassembling the firing mechanism may be done either when the block is mounted or dismounted. To

disassemble the firing mechanism remove the trigger-shaft detent pin and trigger shaft, unscrew faceplate on the rear end of the breech block with a tit wrench and pull firing mechanism out with the fingers or small pair of pliers. Remove the cocking lever. Insert the flat end of the trigger shaft in the slot in the spring shoe, push down and turn clockwise to disengage the dowel pin on the shoe from the shoulder in the slot in the firing pin. This releases the shoe from the firing pin, allowing the shoe and firing pins to be removed. The sear and sear spring may be removed from their recess in the firing-pin hole with the fingers or pliers.

A small hole has been drilled and tapped in the side of the breech block for convenience in assembling the sear and spring when difficulty is experienced in assembling or disassembling these parts. After assembling, this hole is closed by a plug which screws into the hole.

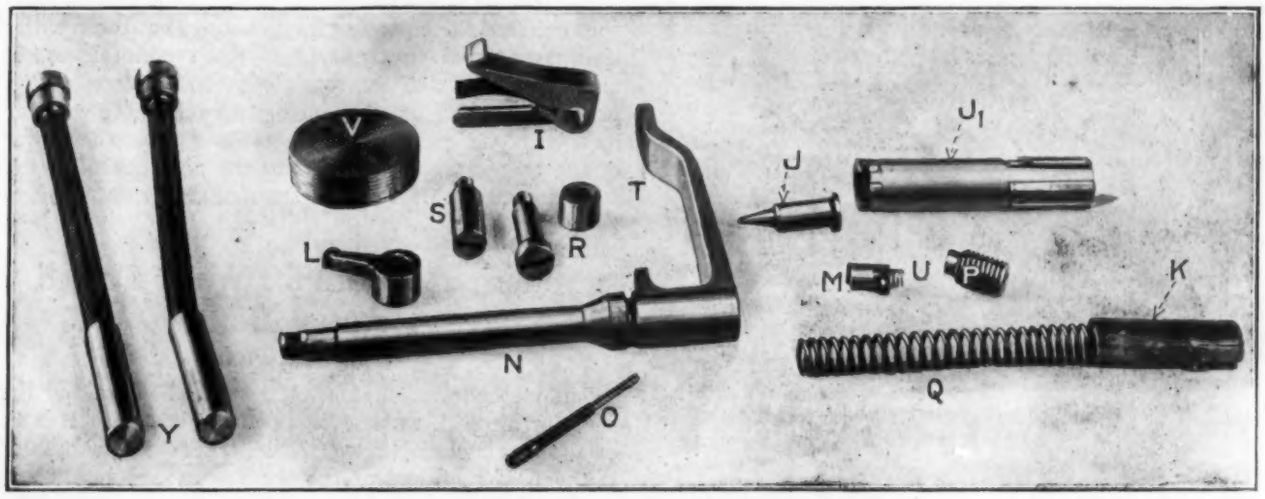


FIG. 5. SMALLER PARTS OF THE MECHANISM

In assembling the firing mechanism the block may be mounted or dismounted. It is impossible, however, to mount or dismount it with the trigger shaft in place. The firing mechanism is assembled as follows: Place the firing spring in the firing pin; place the shoe over the end of the firing spring; engage the flat end of the trigger shaft in the slot in the shoe and turn so that the dowel pin on the shoe is opposite the rear end of the slot in the firing pin. Push down on the shoe until the dowel pin on the shoe is opposite the shoulder in the slot in the firing pin. Turn the shoe counterclockwise until the dowel pin engages forward of the shoulder in the slot and locks the parts together. Insert the end of the cocking lever through the slot in the firing pin. Place the sear spring in the sear and place the sear and spring in place either by removing the short screw which closes the end of the sear hole or, by using a knife or small pair of pliers and inserting from the firing-pin hole, insert the assembled firing mechanism in the recess in the block and screw the faceplate home. This completes the assembling of the firing mechanism with the exception of the trigger shaft, which must be assembled when the block has been mounted in the breech recess.

The firing mechanism having been assembled in the block, place the hubs of the extractors in their respective recesses, insert the extractor plungers and plunger springs and place the plugs in the end of the springs. Compress the springs and screw the plugs home. Care must be given this last operation for the same reason given in disassembling. Insert the breech block in the recess from the bottom and lift up and hold it in place with the eyebolt or clamp, so that the top of the block is flush with the top of the breech end of the gun. Insert the hub of the operating arm in the recess of the breech block and then slide the operating shaft into its bearings. Place the operating handle on the end of the operating shaft and hold it in place by aid of the operating-shaft detent. Slide the lock plate in place and secure by driving the lock-plate key. Slide the spring case in place and connect the chain and spring to the operating shaft with the chain-terminal link pin. Screw up on the piston-rod nut until the required initial tension is on the spring. Allow the weight of the breech block to rest on the operating arm and remove the eyebolt from the breech block. Insert the trigger shaft and secure it in place with the trigger-shaft detent. This last operation can best be performed when the breech block is in open position. A light blow with the palm of the hand on the end of the trigger shaft will assist the square on the trigger shaft to take its place in the recess of the cocking lever.

To Open the Block—The operating handle is grasped around the grip and rotated to the rear approximately 90 deg., compressing the closing spring and rotating the operating shaft. The rotating operating shaft rotates the operating arm, and as the outer end of the arm moves downward it allows the block to slide downward in the recess. This movement continues until the lower surface of the projecting part of the operating arm comes in contact with a lug provided for that purpose at the bottom part of the breech end of the gun. During the downward movement of the block the inclined grooves on its sides force the extractor trunnions forward and rotate the lips on the extractors away from the end of the tube, thus extracting the cartridge case. When the block reaches the limit of its downward motion, the extractor trunnions come opposite the point where the lugs forming the front sides of the grooves in which they move are cut away and are forced over

the horizontal surface at the top of lugs by the extractor plungers, thus locking the block open.

To Close the Block—A round of ammunition is inserted smartly and the flange on the cartridge case catches on the lips of the extractors and rotates the lower parts, which carry the trunnions to the rear, disengaging the trunnions from the locking surfaces. As the block is no longer locked down, the pull on the chain terminal exerted by the closing spring causes the operating handle to rotate upward, carrying with it the operating shaft and operating arm which raises the block. These parts move with increasing velocity until the operating arm reaches a point where it is approximately at dead center with respect to the motion of the block, so that the upward motion of the block is reduced gradually. The rotating parts are brought to rest by the striking of a bearing surface on the operating handle against a corresponding surface on the latch plate and the block locked in the close position.

NOMENCLATURE OF THE BREECH MECHANISM

Number	Mark	Name of Part	Location
1	A	Breech block	In breech recess.
1	...	Vent bushing (not shown)	In front of breech block.
1	V	Faceplate	Closes firing mechanism recess.
1	J	Firing pin	In firing-mechanism recess.
1	Q	Firing spring	In firing pin.
1	K	Firing-spring shoe	In firing pin.
1	L	Cocking lever	In firing-mechanism recess.
1	M	Sear	In firing-mechanism recess.
1	M	Sear	In firing-mechanism recess.
1	U	Sear spring	In firing-mechanism recess.
1	P	Sear-spring seat	Incloses hole bored for sear.
1	N	Trigger shaft	In recess in block.
1	O	Trigger-shaft detent with spilt pin	Secures trigger shaft in breech block.
2	D	Extractors (right and left)	In breech recess.
2	Y	Extractors plungers	In extractor-plunger holes in breech end.
2	W	Extractor-plunger springs	Extractor-plunger holes in breech end.
2	Y1	Extractor-slide liners, R. & L.	In right and left side of breech block.
2		Extractor-plunger plugs (not shown)	In extractor-plunger holes in breech end.
1	A3	Operating shaft	In recess in lower part of breech end.
2	A2	Brass operating-shaft bushing	On operating shaft.
1	...	Operating slide liner, upper (not shown)	In lower part of breech block.
2	...	Operating slide liner, lower (right and left), (not shown)	In lower part of breech block.
1	C	Operating handle	On right end of operating shaft
1	A1	Operating arm	
1	...	Operating-handle plug (not shown)	In end of operating handle.
1	E	Operating-shaft detent	Holds operating handle on operating shaft.
1	B	Lock plate	On bottom side of breech ring.
1	X	Lock-plate key	On bottom side of breech ring.
1	F	Closing-spring case	Dovetailed to right side of jacket.
1	H	Closing spring	Inclosing spring case.
1	G1	Closing-spring piston	At front end of closing spring'
1	G	Closing-spring piston rod	Connected spring piston and chain.
1	G2	Closing-spring piston-rod nut	On piston rod.
1	G3	Locknut	Holds piston-rod nut in place.
1	G4	Chain	Connects piston rod and operating handle through chain terminal.
1	G5	Chain terminal	Connects chain to operating handle.
1	Z	Closing-spring case key	Secures case to jacket.
2	G6	Stud link pins	Secure chain to piston rod and operating handle.
1	I	Return catch	Pivoted on left side of breech end.
1	I1	Return-catch spring	In return catch.
1	R	Return-catch pin	Pivots return catch.
1	T	Return-catch pin washer	On pin.
1	S	Return-catch stop	Screwed into left side of breech end.
1	B2	Latch bolt	Screwed into latch plate.
3	...	Latch-plate bolts (not shown)	Fasten latch plate to right side of gun.
1	B1	Latch plate	On right-hand side of gun.
3	B3	Latch-plate bolt-lock, screw	In latch plate and bolt.
1	B4	Latch	Fastened on latch plate.
1	...	Latch spring (not shown)	Holds latch in place.
1	B5	Spring cup	Holds latch spring and forms working surface against latch.

To Fire the Piece—The projecting end of the trigger shaft is forced to the rear either by the firing shaft on the cradle or by the lanyard and the trigger shaft being rotated. The cocking lever carried on the square portion of the trigger shaft is rotated and the outer end bearing against the rear of the spring shoe causes the shoe to move forward, compressing the spring until the projecting shoulder on the cocking lever engages a corresponding shoulder on the sear and disengages the latter from the firing pin, allowing the pin to be thrown forward under the compression of the spring, thus firing the piece. After the pin has gone forward the firing spring is still under its initial compression. The pressure of the firing spring is conveyed to the front side of the cocking lever by means of the spring shoe, and the same pressure is conveyed to the rear of the firing pin by the rear edge of the slot in the pin through which the cocking lever projects.

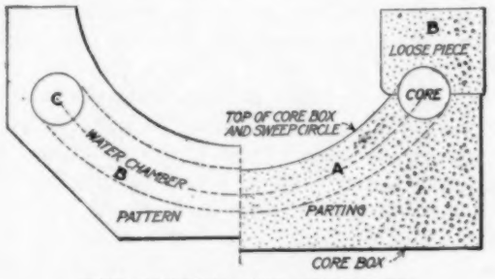
These two pressures are equal and opposite, and would tend to rotate the cocking lever about a point halfway between their points of application, but the cocking lever is pivoted on the trigger shaft and can rotate about the center of the shaft only. Therefore, as the pressure applied by the spring shoe has the greater lever arm, the cocking lever is rotated about the center of the trigger shaft and carries the pin back until the sear engages in its slot and the mechanism is ready to be fired.

Pattern and Core for Water-Cooled Journal Box

BY M. E. DUGGAN

The method described below was used in making the core for an 8-in. water-cooled journal box. The length of the water chamber was 9¼ in., and the thickness of the wall at each end of the chamber was ⅞ in. There were two holes in each end to receive the circulation and discharge pipes. The pattern for the box presents no difficulty, but the making of the core opens up an opportunity for discussion as to which of several different methods is the best, the question being to determine which may be most favorable to the core maker or molder.

In the sketch the portion to the left shows the casting, while at the right is shown a part of the core box



THE CASTING AND CORE BOX

with the core in dotted outline. The core is made in two parts separated on the line *A* which enables the core maker to place the binding wires easily. Vents are cut in the joint faces and the two parts pasted together.

The inner face of the core is swept off to conform to the shape of the box, and the hubs are formed by the loose pieces *B*. This method insures a perfect core and a sound casting. Though it may be a little more trouble for the patternmaker, the results justify the extra expenditure.

Significant Changes in Business Management

SPECIAL CORRESPONDENCE

The war has brought many changes, but none which seems destined to play a larger part in future development than the changing relations between capital and labor. Those who have studied the question seriously believe it is necessary for progressive business men to join hands with the more conservative labor men in working out a sane and rational labor policy. Unless this is done grave consequences may follow. Conservative thinkers like Justice Hughes and ex-President Taft believe that it is necessary to change many of our ideas regarding industrial relationships. And the object of this article is to point out some of the lines of thought which may help us along the new road and prevent violent changes which may upset our whole civic organization.

NO ONE who is interested in the welfare of the country, and that means every right-thinking individual in any walk of life, can afford to overlook the relations between labor and capital in all parts of the world. We can forget the utterances of the Bolsheviki if we wish to, as representing the extreme of radicalism, but we cannot forget the utterances of Charles M. Schwab, of Major Thompson, of Roger W. Babson and particularly of that great conservative, Justice Charles E. Hughes. We can gain nothing by shutting our eyes to the facts—and we may lose much.

The platform of the British Labor Party is a remarkable document, which may be called evolutionary rather than revolutionary. And we have the authority of such men as Sir Stephenson Kent and others that the British manufacturer is quite convinced that the labor organizations will have a much greater voice in the management of shops than ever before.

A new development along this line is the introduction of what is known as "shop stewards," who represent the men whether they are members of the union or not. The union authorities seem to have lost touch with the workers in many places, just as they have in this country, but instead of this leading to disorganization and an abandonment of the principle of collective bargaining it has simply evolved a new form of direct representation in the workshop. The engineers of the Clyde district are said to be completely governed by this new method. To some extent the same tendency is noticeable here, as in the coal-mining districts and in the dispute of the Boston elevated men. The rank and file of labor must feel that it is getting a square deal, from its own leaders as well as from the employers, otherwise the leaders cannot make bargains for them.

The report of the Federal Commission of Mediation shows plainly that we are facing a new era, and the report may be summed up in six counts:

1. The elimination of profiteering during the war as absolutely necessary to the morale of industry.
2. A form of collective relationship between management and men, and they advocate the recognition of this principle by the Government as a part of the labor policy of the nation.
3. The adoption of the eight-hour day with suitable remuneration for overtime.
4. A single-headed labor administration with full power to establish the necessary organization. This is already under way, with Secretary Wilson as its nominal head.
5. The education of labor to the causes and aims of the war and in the broader relationships with capital.
6. The education of employers to the essentials of the modern labor policy and its broader relations with its employees.

To every one of these points all business men can well devote considerable thought, as on the broad understanding of the question depends the future of the country. For while they may be called war-time conditions, what will be the answer when labor asks why they cannot continue in times of peace?

There may also be something significant in the new laws of Maryland and New Jersey, which make idleness of healthy adults a crime unless it is temporary as the result of some labor dispute. Production is the order of the day, and we may be sure that the workers will not see this law enforced against them and not against those who have no visible means of support but a bank account. Production is what counts in this war, and the same principles will probably be applied after the war is over.

A Feeling of Kinship

The fellowship of the workshop, like the fellowship of the trenches, produces a feeling of kinship and brotherhood which can be experienced in no other way. One danger may be that the hand worker of the less skilled trades may not see that the brain worker who plans the work for him is just as much a worker and a producer as himself.

The aloofness of the brain worker himself has in the past been largely responsible for this feeling. Engineers have objected to being classed as labor and have in that way laid the foundation for distrust. Both sides must understand that all who work and assist production must be classed as labor, whether they also have capital invested or not, and that those who invest only capital and do not assist production deserve far less return than those who actually assist in production, no matter what their capacity.

The first requirement—the elimination of profiteering—is perhaps no more difficult than any of the others. It requires a new conception of the rights of capital just as the other does of the rights of labor. But new conceptions of many questions are the order of the day and we shall have to adjust ourselves to them.

Many will consider the second requirement even more difficult. These will be the men who understand capital and business thoroughly, but who have not come to think of their business as anything except a strictly private affair, which privileges them to do exactly as they please without regard to the effect on the com-

munity or on its individual members. And, having progressed beyond this stage, many broad-minded men are apt to ask how there can be any different relationships than exist at present.

This problem has been anticipated by some of the farsighted business men of the country, and much thought has been given to it. Perhaps one of the best examples can be found in the large department store of William Filene's Sons Co. in Boston, Mass. Here the employees, numbering over 2000, have an organization known as the Filene Coöperative Association, to which every regular employee belongs by virtue of his employment. No dues are imposed, but every feature of the work of the association is planned to be self-supporting. Participation by the members in the various features of the association is optional. Its progress has more firmly established a true spirit of willing cooperation between the employees and the corporation to the end that the general welfare of the employees may be conserved and their efficiency increased.

The purpose of the association is to prevent the enforcement by the management of unjust rules affecting the discipline and working conditions of the employees; to prevent unjust discharges or removals of employees; to inaugurate new rules affecting the discipline, work and conditions of work of employees when necessary; to conduct the social and so-called welfare activities of the store without the dictation, but with the cooperation of the management, and in general to enable all of the employees of the corporation to have enough voice in the government and administration of the store to make it just, considerate and effective, and to develop a healthy atmosphere of real service to customers and to each other.

Two-thirds of the members of the association may vote in mass meetings to change, initiate or amend any rule that affects the discipline or working conditions of the employees of the store. It elects a council which is its governing body. If five-sixths of the members of this council vote in favor of the rule or change suggested by the mass meeting it goes into effect at the close of one week unless it is vetoed in the meantime by the general manager, president, or board of managers of the corporation, or by a majority vote of the association itself.

But to show how thoroughly democratic the management is, even the veto of the management itself does not kill the new rule if a two-thirds vote of a mass meeting can be secured to pass the rule over the veto.

Employees on Board of Directors

The employees are represented on the board of directors of the company by members of its council sitting with the owners of the business. These representatives now number four out of a total of 11 directors. The balance of power in this case lies with the employers and managers, but they are apt to think twice before they introduce a change which is solidly opposed by the representatives of the employees.

There is another board, however, in which the entire power rests with the employees. This is known as the Arbitration Board, and it is all-powerful in the matter of discharging, fining or otherwise disciplining the employees of the store.

If an employee feels that he or she has been unjustly discharged or fined the case is brought to the Arbitration Board, which is composed entirely of employees duly elected by the coöperative association. The case is tried as in a court, both sides being heard either in person or represented by someone acting in his or her place. The decision of this board is final; neither side can appeal from it.

This plan has been in existence for a number of years, and the Arbitration Board has tried many cases. The decisions are considered satisfactory by the firm, even though they seem to be about equally divided in placing the blame. A large number of the decisions were reviewed some time ago by the well-known jurist, Judge Brandeis, and pronounced as fair and as equitable for all concerned as the decisions of the average court of the country. This indicates clearly that the decisions do not unduly favor the employee. It also shows what has always been shown in similar cases—that imposing responsibility on anyone of average intelligence makes him more careful in his judgment and prevents extreme radicalism more effectually than anything else.

This plan will not appeal to the man, be he foreman or owner, who has always considered it his privilege to discharge anyone at sight without a reason being necessary. But those who calmly study the cost of such indiscriminate hiring and firing and who can put themselves in the position of the man or woman who objects to being the plaything of the whim of a foreman or even of the owner can see how such a plan makes for greater coöperation and a more stable feeling among the employees. When added to this there is a bonus system it does not take the average employee long to see that it is money out of his or her pocket to keep men or women who are not doing their full share of the work.

How It Works

In few if any businesses in the world have the employees a stronger voice than in the one now being reviewed, and it is particularly interesting and illuminating to see how this power has been used. One incident, dating as far back as 1911, shows that the employees have not used their power as a club to force unfair concessions, as is possible under a democratic form of government. The question to be voted on was whether the store should be closed all day Saturday, June 18, the day preceding Bunker Hill Day, which is a holiday in Massachusetts. If this were done it would give the employees a three-day holiday, and a precedent for such a vote had been established some years before when they had voted to close the store on July 5 (a Saturday), the holiday coming on Friday.

Preceding the mass meting there had been intense feeling in the matter, as all were naturally interested in having an additional day, with pay, as was customary. The meeting was to hear both sides of the question and to decide. After those in favor of closing had made their plea, those opposed brought out an argument which few had considered. It was pointed out that a Saturday in the middle of June was much more valuable and more costly to lose than one in July, that it was the last Saturday before most of the school graduations, and that more business would probably be lost. When the vote was taken it gave an overwhelming majority *against* the extra holiday.

It is not necessary, however, to go outside the machine-building industry to find some good examples of methods which are securing real coöperation between the owners and the men in the shop. The Bullard Machine Tool Co. of Bridgeport, Conn., the White Motor Co. of Cleveland, Ohio, and the International Harvester Co. with shops in various cities, and others, may be mentioned which have introduced the idea of cooperation.

Minimum Rate

Included in the Bullard plan is a minimum rate which compares favorably with the wage of its locality. Then there is a bonus based on production efficiency as carefully figured out against standard time set for each job. This bonus gives the men 1 per cent. for each per cent. above 75 per cent. of the time fixed as standard. If he does the job in standard time he receives 25 per cent. of his wages as a bonus. This is computed monthly and includes all work done during that period.

There is also another bonus or premium based on prompt, regular and continuous service. This is a 10-per cent. premium of the employee's weekly wages earned during the regular hours of operation provided he has worked a full week, but the premium is not paid on overtime work. Premium vouchers are inclosed in the pay envelope each pay day and become payable four weeks after issue provided the person is still in the employ of the company.

In addition to these bonuses every employee is insured under the group-insurance plan, the minimum insurance of $500 being given to all who have been continuously employed for six months, and the maximum of $1500 after ten years of employment. If at any time before he reaches the age of 60 years he becomes totally disabled either by disease or accident the insurance due will be distributed in equal payments over such a period as may be determined after a conference.

This, however, is not all. In addition there is the real touch of fellowship or brotherhood without which no plans or methods can be most effective. A man who had acted promptly and wisely in an emergency was sent a little letter of appreciation by the manager. Not a perfunctory form letter No. 17, but a little message just as it would have been spoken, and just as it had been spoken previously. A little thing, but one of the little things that count.

Other Evidences of the Trend

That there is a marked tendency toward a newer and more democratic form of shop government cannot be doubted. The evidence increases on every side. One of the latest and most notable additions to the list is the Standard Oil Co. of New Jersey, which has formulated some important changes at its plant in Bayonne, N. J. The details have not been all worked out as yet, but the fact that the men will have a voice in these details gives some idea of how far the democratic spirit has gone.

The plan includes annuities, sick benefits and general improvement of working conditions, but not with the spirit of charity or paternalism. The architect of the houses which are to be built will consult with those who are to occupy them as to the arrangement of rooms and minor details. These houses will be put on a business basis so as to provide a moderate return on the investment. The men are to be represented in all matters of shop government, and indiscriminate hiring and firing is relegated to the background.

The value of some such method can hardly be questioned when we realize what a somewhat similar plan has done for the mining situation in Colorado where a state of civil warfare existed a few years ago. While the new arrangement may not be perfect it is certainly a long step in the right direction, and it is probably only fair to credit John D. Rockefeller, Jr., with an honest desire to really improve the relations between the men and the company.

Just how these methods of management can be worked out for the small or even average sized machine shop remains to be seen. But there can be no doubt as to the tendency toward securing greater harmony and also greater interest in this way. Both go together and both are highly desirable.

Exercises for Office Employees

By E. Roche

The Simonds Manufacturing Co., Fitchburg, Mass., has introduced another innovation to its many good plans for the welfare and health of its employees, and it is proving to be very popular.

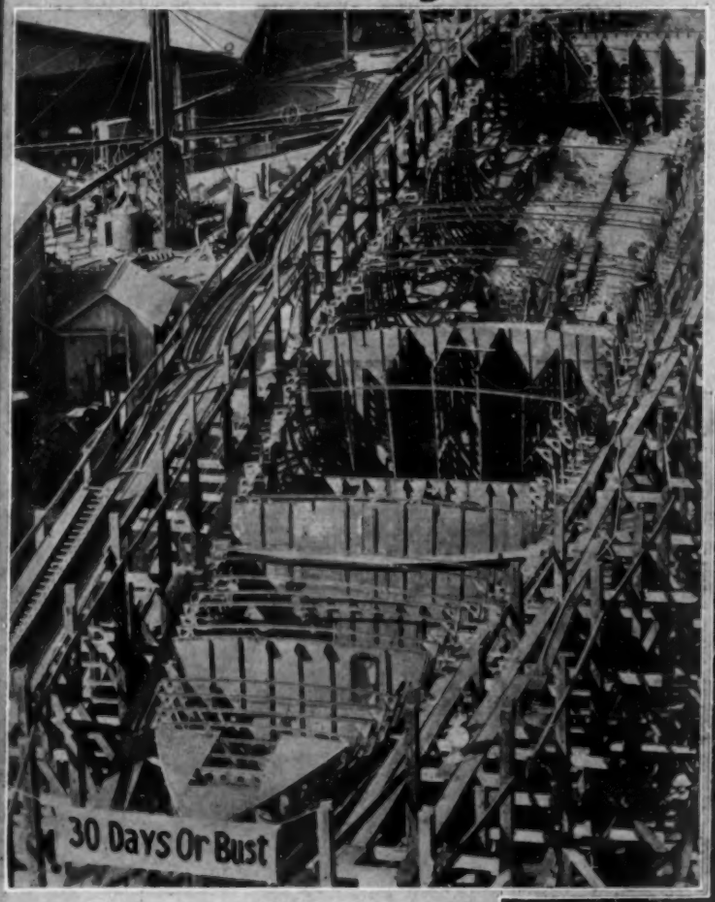
Calisthenics or physical exercises designed to benefit the 125 or more people employed in the office of the company at the Fitchburg factory are conducted daily.

GROUP OF OFFICE EMPLOYEES EXERCISING

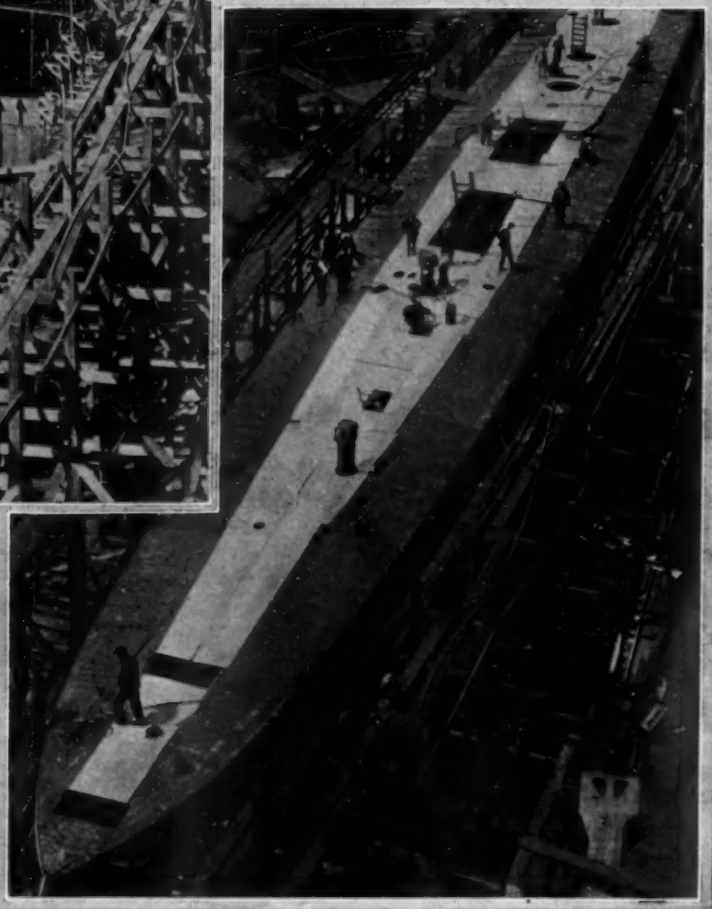
Exercise is held in the spacious hall of the Daniel Simonds Recreation Club, located conveniently to the main office building. Each forenoon at 10 o'clock and afternoon at 3 o'clock the office force, under the direction of William Brooks and Charles E. Woods, who have had experience in Y. M. C. A. work, assembles and goes through the lighter forms of calisthenics. The periods consist of 15 min. each, but only half of this time is required for the exercises, the remainder being spent by the employees in various ways. Many engage in dancing, while others rest.

Physical exercise was instituted by the Simonds company after careful study. It has been established that the two 15-min. periods each day relieve the workers from their steady application to their office duties, make their minds work more quickly and accurately and drive away any tired feeling, so when they return to their desks they are refreshed and able to do better and more efficient work

Building U.S. Destroyer



Upper picture, destroyer 24 hours after the keel was laid



Lower picture, the same boat five days after the work started

SO MUCH has been said about the building and launching of the large cargo-carrying vessels that we are apt to overlook the fact that we are also building and putting into active service a large number of small patrol boats, "Eagles" and destroyers. Very rapid work is being done on many of these smaller sizes, and the illustrations show the early progress in the construction of the U. S. destroyer *Ward*, being built at the Mare Island Navy Yard, California. The upper picture shows the vessel 24 hours after the keel was laid. As much structural work as possible was prepared in advance, and bulkheads, sections of the keel, deck houses and bridge structure were riveted up ready for assembling in place on the ways.

The lower picture shows how the work looked five days after the laying of the keel, and is as astonishing as the rapid progress revealed in the first picture. These pictures are copyrighted by the Committee on Public Information.

Essentials of Bulldozer Operations —The V-Blocks—

By J. V. HUNTER
Western Editor *American Machinist.*

With the exception of the very necessary modern steam hammer it would seem that the second most useful machine for general forge-shop use is the bulldozer. This would indicate that it was more useful than the forging machine, but this is more properly an adjunct of the more highly specialized shop, such as shops for making bolts or similar work, while the place for the bulldozer is for all-around bending operations.

THE bulldozer is a nickname used by almost every machine blacksmith in the country for what is essentially a bending machine. This name was originally given by a manufacturer as a trade name for a bending machine made by him, but the fact that some firm originated the name has been almost forgotten in the general use that smiths make of so calling every bending machine.

The ultimate value to a shop of any machine depends upon the amount of practical use that can be made of it; and if blacksmiths will persist in performing operations by hand when the quantity is sufficient to perform them more economically on a bulldozer the fault for its nonuse might lie in the forge-shop foreman who may not understand the machine sufficiently well to instruct his men in its advantages. Very frequently a bulldozer is purchased and placed in a manufacturing shop which needs it for the production of a few varieties of bent shapes that are being made in large quantities, and often the machine has been sold on the promise to perform the work on these parts in a satisfactory manner. At the same time the machine builder might have furnished the necessary dies. So the designing of dies for other work is left to a foreman whose training never included experience with a bulldozer.

Even a most ingenious blacksmith would have a difficult time in arranging his bulldozer to handle every job that might come into the shop unless he had had some previous experience. With this in mind a description of some of the uses of the simplest die of all—the V-block—and the way that it has been arranged to handle many classes of work will no doubt be of interest to those who have such a machine in their shops or may decide to get one.

V-Block Dies

The V-block dies are just what their name implies—a male and female V—and in another form, for handling work by hand, should be familiar to every blacksmith who has ever handled a steam hammer.

In Fig. 1 we have a sketch of a set of typical V-blocks as arranged in the die space of a bulldozer. These are usually made of cast iron, lightened as much as possible by deep pockets and machine-finished on only those faces that will come into contact with the machine and on the two working faces. A ¾-in. hole is drilled and tapped in the top of each for the insertion of an eyebolt when it is desired to use the crane or tackle for lifting the blocks on or off the machine. In service they are bolted securely to the slotted heads to prevent shifting.

While mentioning the slotted heads for bolting on the dies attention may be drawn to the fact that this is by far the most convenient method of attaching the dies for service, and yet for some reason (possibly to cheapen the manufacture) some bulldozers have been built without slotted heads. In these cases users have sometimes had slotted heads cast and machined in their own shop for permanently bolting to the die heads of the bulldozer.

For standard V-blocks the working faces are made at an angle of 90 deg. with one another. The working edge of the intersection of these faces on the male block should be rounded to the radius most suitable for the majority of the work that is going through the shop. Some shops may have several male blocks made up with different radii to meet special requirements. Such a difference in the radius of the point is illustrated in Fig. 2 at *A*, which has a large radius, and at *B*, which has a very sharp point. The heavy solid lines in all cases represent the position of the work in the dies. Thus it will be seen at *A* that the work forms tightly to the shape of the rounded point, which is the determining factor, and does not crowd forward at all into the empty corner of the female die.

The Bending Action

Where a certain radius has been specified for a right-angle bend and no male die is available of the correct radius, another method of obtaining a variety of radii is that illustrated in Fig. 3 at *X* and *Y*. Suppose we start with a sharp-cornered male die, as at *Y*, and wish to make a bend of approximately ¼-in. radius, the first operation will be to bend up a plate of ¼-in. thickness to fit around the nose of the point; this is shown in the lightly dotted section. The bending action on the outside surface of this extra plate gives the desired radius to its outward nose, and it is then used as a portion of the die, being permitted to ride there loosely if there is only a small amount of work to be got out, or fastened on temporarily with countersunk screws if there is to be a great deal.

The next part to be made may call for a very much greater radius of bend, and this is provided by making an extra nose of sufficiently heavy material, as shown at *X*.

Another point that should be mentioned is the desirability of having the V-cut in the female die about 25 per cent. deeper than the length of the male-die point; this will insure smoother work and easier bending.

Sometimes it is desired to make bends less than a right angle. This can be done without any additions at all and the 90-deg. V-blocks can be used for this purpose in the manner illustrated in Fig. 4 at *M*. This is a kinking operation that depends upon only advancing the male die a sufficient distance into the groove so that a kink of the desired angle will be produced without the material being squeezed down flush with the walls of the blocks. This can be accomplished by running the bulldozer head forward enough to produce the desired angle and then stopping it and reversing; but this method is slow and difficult when uniform results are wanted. It is much better to remove the right number of shims from behind one of the dies so that the dies will only close sufficiently during each full turnover of the machine.

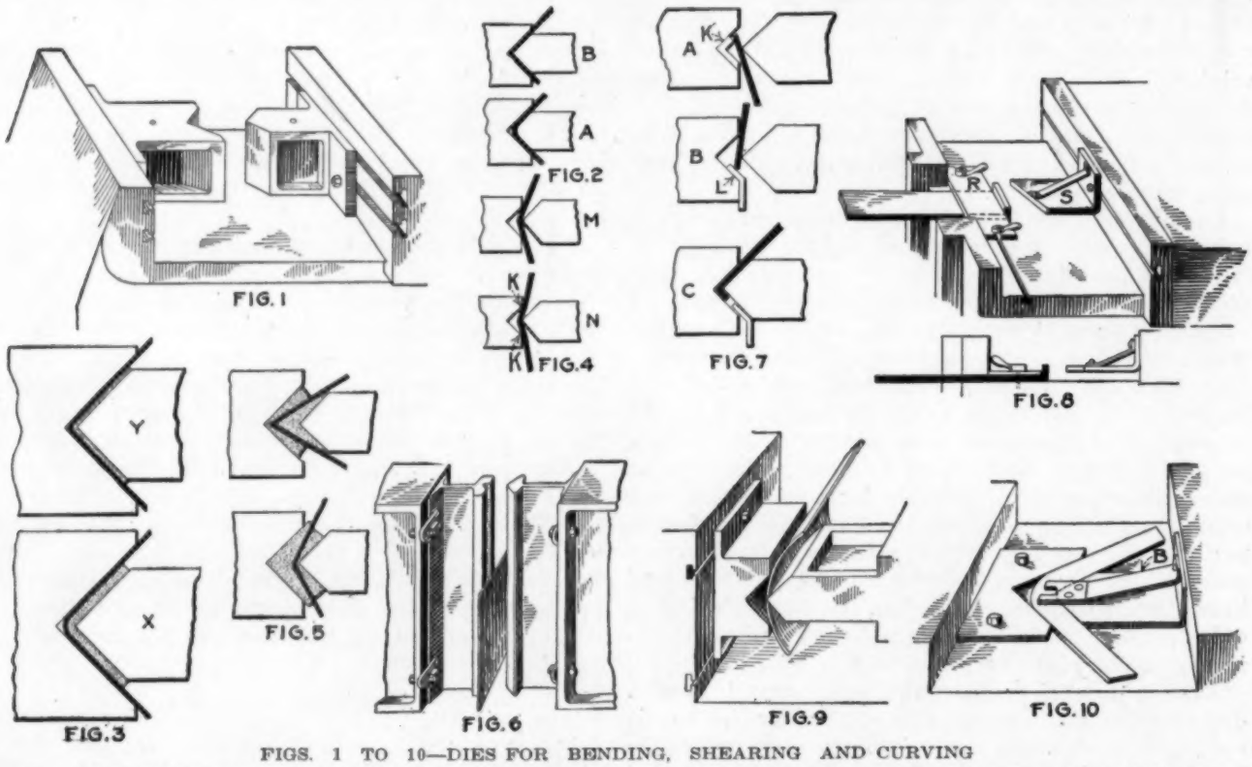
The above method of obtaining an obtuse angle is of more service in working cold stock than in hot. When the bars are hot the result shown at *N* often occurs; the stock is then so limber and soft that the outer ends drag back sufficiently on the die bed and from their own inertia put the additional kinks in the bar as seen at *K* and *K*. However, this trouble can be expected to occur even when the dies fully close in making a 90-deg. bend, and may best be avoided by obtaining the shortest possible heat at the exact point where the bar is to be bent.

With dies that close fully in producing an obtuse or acute angle bend it is possible to remove any kinks of this kind by stopping the machine movement when the dies are fully closed and pulling the ends around by hand until they are straight in line. Such a procedure obviously would be impractical where dies are used with the part-closing method described in Fig. 4, and for that reason the methods as shown in Fig. 5 are the best to use for the purposes of forming other than right angles.

The supplementary filler blocks are in this case again shown in the dotted shading, and in most cases they are made up by the blacksmith right on the job by forging these filler blocks as straight pieces with tapered edges or centers, depending upon whether it is intended for the male or female die. After these have been forged to approximate size they are put together between the V-blocks and bent to shape. At times they require additional smithing work to form them into more accurate shape after the bending, particularly the male section, which in most cases requires further drawing out on the point. These filler blocks can then be fastened to the dies with countersunk machine screws.

The widest use made of filler dies of the above description is probably in closing in or opening up connection angles such as are used for structural work; but the varieties of angles that occur in this work are too great to warrant the use of permanent dies, and consequently such filler blocks are of great value. In this connection the male-die point will not require drawing out to so great an extent because of the fillet wanted inside of the angle, and it will be correspondingly easier to produce the die.

The V-blocks will also be of use for bending up flanged plates or other wide sheets, especially if they are long enough to handle this class of work. One special set of V-blocks that was made up for bending plates is illustrated in Fig. 6. These were very quickly made up by planing two sections of heavy T-rail. The edge of the male block can be made with a sharp



FIGS. 1 TO 10—DIES FOR BENDING, SHEARING AND CURVING

Fig. 1—Typical V-blocks. Fig. 2—V-blocks with different radii. Fig. 3—Bending round corners with a sharp-cornered die. Fig. 4—One method of bending obtuse angles. Fig. 5—A better method of bending other than right angles. Fig. 6—Bending plates. Fig. 7—Making short bends on ends of bars. Fig. 8—Shearing dies. Fig. 9—Curving plates. Fig. 10—V-blocks for bending bars edgewise.

edge with the assurance that it will stand up when bending cold sheets and give a square, sharp corner. The narrow rail-section die has the advantage that in making a second bend close to the first there will be clearance on the block.

A very important point is that in bending with the V-blocks the bar must extend across the female die from one corner to the other in order that these may hold it when the other die comes against the work. From this it will be seen that a very short end cannot be bent with a deep, wide-notched die, consequently it is desirable to have dies with narrow notches as well as ones for deep bending, and this variety should be supplied in the heavy cast dies for heavy work. With the dies made of T-rail sections, as illustrated, the notch will naturally be narrow and suitable for short bends on light work.

Making Short Bends

Methods of making very short bends on the ends of bars is shown in Fig. 7. These are a few kinks that may be useful when a small number of these ends are to be bent up and a more expensive die is not warranted. At *A* is shown a way that is entirely satisfactory in bending medium-weight bars—the piece *K* being a loose forging with one short arm which serves to grip the outer end of the work. This method does not give the best grade of work when bending very thick bars, and for that purpose the methods illustrated at *B* and *C* may prove more suitable. At *B* is shown the temporary block *L* laid on one outside corner of the main block so that it catches the end of the bar being worked. The point moves forward until a considerable but not a complete bend has been accomplished; it is then stopped and *L* is partly withdrawn, as in *C*. The final squaring up of the short end is then accomplished in the bottom of the main V-block.

There are special cases in railroad and similar shops where the shortest ends that can be produced by the foregoing methods are too long; a method of shearing these off while hot in an open end bulldozer is shown in Fig. 8. In this case the shearing blade *S* is simply constructed of a piece of medium-carbon (not tool) steel, using a wide bar or plate of this and bending up the back end at a right angle to provide means of bolting up and attaching the stiffening brace shown. The counter shear *R* will also be a mild-steel bar, with slotted ends for ready removal of the holding-down bolts; this bar will be of the same thickness as the desired length of the end. In use, the moving-shear blade cuts off any extra length of end even with the top of the bar *R*. Of course with light bulldozer tools of this nature the work will have to be done hot.

When a shop is not equipped with rolls of any kind for rolling up plates the method of rounding up a sheet using V-blocks, as shown in Fig. 9, will prove useful. The V-blocks are set so that the kink they put into the plate will be close to the required radius of the bend. The sheet is then fed between them a small amount at a time so that the kinks put into it at each stroke of the bulldozer will be very close together. A careful workman can thus produce a very smoothly rounded-up sheet in a fraction of the time that the same result could be accomplished by hand methods with a fuller and sledge.

The ordinary type of V-block will not prove suitable for bending wide, thin bars edgewise, chiefly on account of the buckling that would occur in the bend, and for this purpose the special type of V-block dies, illustrated in Fig. 10, must be used. These can be cut out of plate, which in the case of the female die can be of the same or of greater thickness than the stock to be bent; but for the male die it must be within $\frac{1}{8}$ in. of the thickness of the work. The brace *B* should be put on the male die with its end projecting over the point in the manner shown, so as to extend forward a distance almost equal to the width of the bar and notched in the center to facilitate the removal of the work after bending. This forward end of the brace serves to hold down the bar during the bend and prevent it from buckling. Another purpose of the notch in the center of the brace end is to permit a view of the mark usually put on the bar by the blacksmith at the point where he wishes to make the bend.

On account of the necessary limits placed between the thickness of the work bent and the thickness of the male die it will be necessary to provide more than one of these dies where there is much variety of work to be bent up in this manner; but as the dies can be produced so cheaply this is of no great importance. In the case of the female dies for this edgewise bending it is also necessary that the distance across the notch shall be comparatively great so that the corners shall not start to compress the material before the bending begins; otherwise a rough edged piece of work will result. In fact for the smoothest result the notch should be so wide that it will extend outside of the immediate area of the heat, and a short heat should be taken.

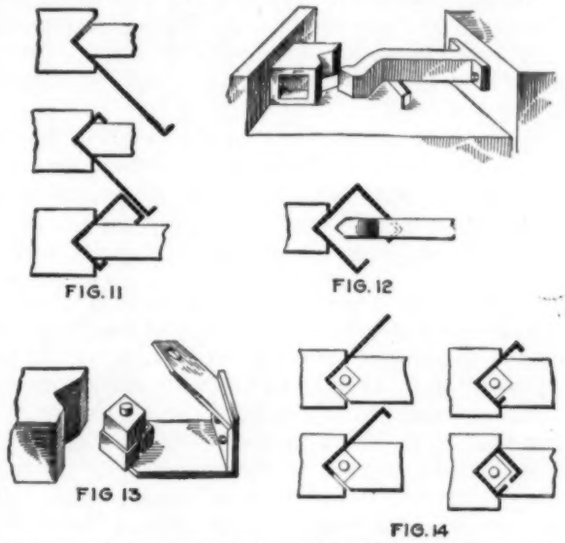


FIG. 11 TO 14. DIES FOR RECTANGULAR SECTIONS

Figs. 11 and 12—Bending rectangular sections. Fig. 13—Dies for making small square sections. Fig. 14—Operations in making small square sections.

In making up a U-shaped forging with bent-in ends there are certain limitations that occur when the ends of the work will begin to interfere with the sides of the male die. These limitations are readily understood from a study of the series shown in Fig. 11. Beyond the point indicated it will be understood that the inside bent ends cannot be longer unless the vertical arms of the forging are also longer.

To avoid such a difficulty the male bending die shown in Fig. 12 was devised. This was forged out of a heavy bar of steel and with the offset just beyond the point to raise it the necessary distance above the bed of the bulldozer, so that the work after making the second bend could extend around underneath the die, as more readily shown by the diagrammatic view in the lower portion of this illustration. If the work to be bent is at all heavy the die should be made stocky enough to avoid trouble from springing away at the point.

The above-mentioned method likewise has its limitations because the offsetting of the point requires some space so that small square bands, such for instance as may be used for banding springs, could not be bent in that way. The V-blocks shown in Fig. 13 will take care of such a case. The male block consists mainly of two plates with a square block bolted to the lower plate, and a dowel pin on top of the square block to receive the upper plate which supports the block at the top during the bending operations. The upper plate is raised up at the outer end, as shown, for removing the completed forging. The illustration shows a forging bent around the block, which must not be confused with the die itself.

The series of operations shown in Fig. 14 describe how this die adapts itself to the four bending operations that are necessary for the completion of a full square.

Methods of Making Bends

The bending of structural sections presents more difficult problems and calls for more special treatment than does the bending of bars and rods such as we have been describing. In Fig. 15 is shown several methods of making bends in angle iron, the simplest method being that at *A*, which is for bending an angle with the leg turned in, and is accomplished by placing a shim under the male die of a thickness equal to that of the angle. This shim must not project further than to reach the angle; in fact it should come considerably short of that distance, because the upsetting of the leg that occurs during the bending will form somewhat of a fillet at this corner.

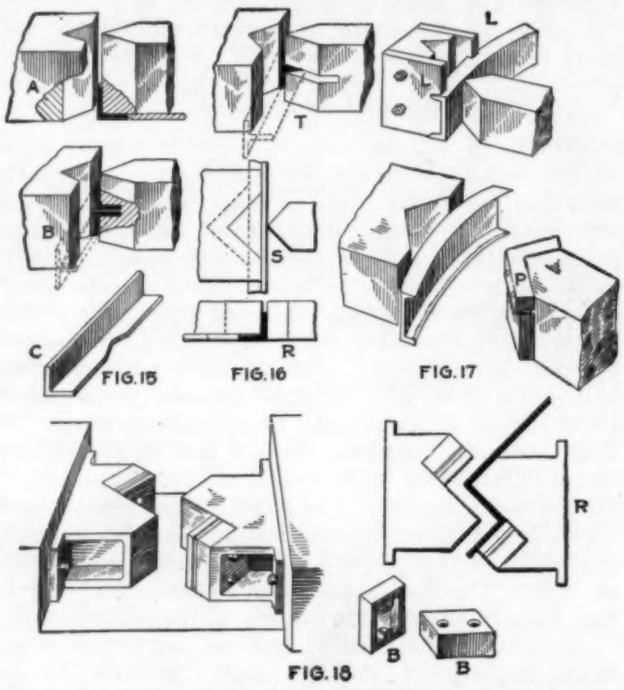
The reverse bend of the angle that will have the leg turned out would be accomplished by the opposite method of placing the shim under the female die.

Much structural designing calls for angles known as rights and lefts, and when there is much bending of this kind to be done it is of advantage to employ the method shown at *B*, where two angles are bent at once, they being placed back to back. A groove passing over the inside legs of these angles is then cut in a special male V-block.

As has been previously stated, much upsetting occurs on the inside leg of the angle when bending in this form, so in order to insure a smooth, uniform corner it is good policy to notch out this leg before bending, somewhat in the shape shown at *C*. The amount of material that should be taken out by such a notch must be determined by trial, only enough being removed to take care of the greater share of the upset steel, and it is always well to leave a good fillet remaining in the bend for additional strength.

Fig. 16 shows at *R* and *S* the methods employed when making the reverse bend of an angle with the leg out. In this case the shim that raises the female block must also be cut out in a V-shape, and must extend under the main block to exactly the length of the leg of the angle, as it is necessary that this leg shall come in contact with the outside corners of this under shim in the same way that the upper leg comes against the main block. The stretching effect on the outstanding leg will considerably shorten and thin this, and if a square corner is necessary after bending it will be necessary to have a smith weld in a small section.

The bending of a T-section is accomplished in the same manner that the two angles were bent at the one time.



FIGS. 15 TO 18. DIES FOR STRUCTURAL SHAPES AND OFFSETS

Figs. 15 and 16—Methods of bending angle iron. Fig. 17—Bending channels. Fig. 18—V-blocks for offset bends

This is illustrated at *T*, Fig. 16, where the male die is shown with a groove cut in it to receive the leg of the T-section.

The bending of channel sections and of I-beams presents a more difficult problem than any of the others, and in the majority of cases requires special dies that would not come under the subject of V-blocks. However, there are numerous cases where channels are required to be formed up to a radius for a guard, frame or similar shape, in which case the V-blocks can be used to do the work.

Such cases may be handled by applying special-shaped blocks to the V-blocks, as illustrated in Fig. 17. Bending with the flange out is really the simplest, because the flange is then subject only to a stretching strain, and should there be a tendency to spread at the points it may be readily closed in. So that the strain and pressure when being worked will not be placed solely upon the flanges, the two specially grooved plates are bolted to the sides of the female block, these pieces being *L* and *L* in the illustration. Of course these could be bolted to any similar block just as well, since they must extend far enough in front of the

block that the flanges of the channel will not come in contact with the block and be crushed. By setting the male die in the same manner as previously described for forming a sheet to a circle and striking the channel a large number of times at short spaces, a very smooth piece of work may be produced.

When forming a channel to a radius with the flanges turned in, a special block *P* must be provided for the end of the male die for the same reasons as in the previous case. Such a block will not need to have a very sharp nose, for too sharp a one might leave marks. It will be necessary to do some of the work on this die in the machine shop, such as the planing out of the grooves, etc., after rough forging to shape.

Bending Round Bars

The bending of round bars in the V-blocks can be accomplished by the same methods as for flat bars if a little flattening is not harmful to the general appearance. Otherwise special V-blocks should be provided with round grooves cut in them to fit the radius of the bar; these grooves should be cut to a depth of about one-third of the diameter of the bar in each die. When bending pipe such grooves are a vital necessity; otherwise the pipe will be crushed almost entirely out of shape.

A great deal of right-angle bending consists of two bends a greater or less distance apart to provide an offset in the bar. To make such bends with a minimum amount of labor, and particularly to insure that these bends will always give exactly the same amount of offset, the double-V-blocks, shown in Fig. 18, have been devised. Each die combines a male and a female die in itself, the distance from the point of one to the recess of the other being so proportioned as to take in the majority of the work that the shop desires to handle in this manner. Twelve inches might be taken as a fair average, with a height of die of from 10 to 12 in.; these dimensions are particularly suitable for car-building shops. Both dies should be identical, and only one pattern need be provided.

Particular Dimensions

When it is desired to get a particular dimension of offset the two dies are built up with the necessary shims, which can be quickly distinguished in either view, and naturally both must be built up to exactly the same amount. To facilitate building up very short offsets a number of cast-iron blocks can be provided, as shown, *B* and *B*, in pairs of different heights, recessing these where possible to reduce the weight. Such blocks should be planed on the two faces to insure uniform thickness, and they should be spaced in with plates or thin sheets to obtain the lesser distances. It will be seen at *R* that the center lines of the two main blocks do not remain in line, but move away from one another as the two dies are built up for lesser offsets.

The variety of work that can be made with V-blocks when intelligently used is so great that almost any simple shape can be produced; but when the work runs into complex shapes, for the sake of economy in manufacture it is customary to provide special dies for each shape, and it may be possible at some other time to take up the study of some of the special features involved in the design of such work.

An Aftercooler for a Compressed-Air Installation

By Joseph K. Long

The line drawings accompanying this article show an aftercooler recently erected at one of the shops of the Pennsylvania Railroad for the purpose of eliminating as far as possible the moisture from the compressed air used by various tools throughout the plant, and thus do away with the trouble experienced

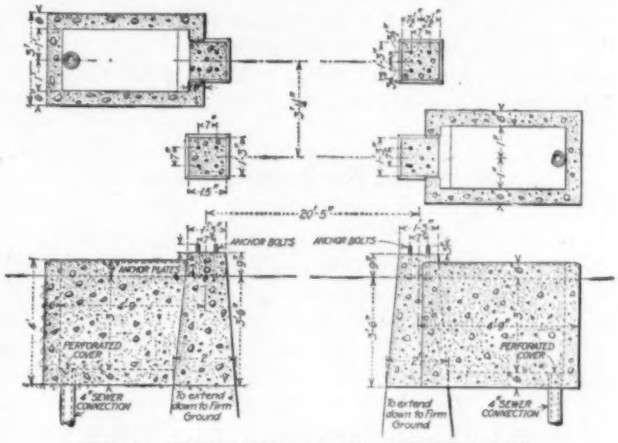


FIG. 1. FOUNDATION FOR AFTERCOOLER

from freezing of the condensate and consequent choking of the exhaust passages of this class of machinery.

The structure rests upon four concrete pillars extending down to firm ground, and there are two con-

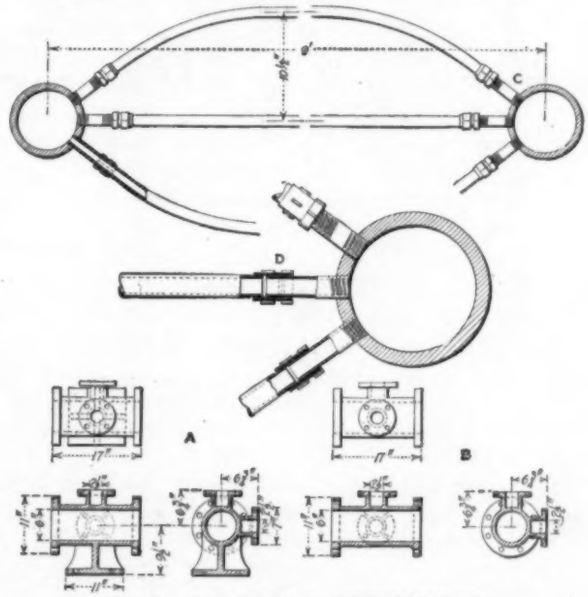


FIG. 2. DETAILS OF AFTERCOOLER

crete basins, each with a 4-in. sewer connection located at diagonally opposed corners of the foundation. Each of these basins houses a trap in connection with a 6-in. special Cochrane separator to serve the two separate and practically independent sections of the cooler. The foundation in plan and elevation is shown in the line drawing, Fig. 1.

The main supports of the structure are four special fittings of cast iron of the general appearance of a tee with a large flanged base, each having one outlet

at the side and another at the top. These two outlets in each tee are blanked so that no air passes the fitting except through the run, which is of 6-in. capacity.

These castings are secured to the tops of the concrete pillars by four bolts ¾ in. in diameter by 12 in. long passing through pieces of 2-in. pipe to special nuts set in pockets in the concrete. The blanked "outlets" at the top and sides of these special tees are threaded to take 2½-in. wrought-iron pipe, which forms the supporting frame-work of the structure. These special castings are shown in detail at *A*, Fig. 2.

At *B* are shown the corresponding tees which form the upper corners of the structure. These are also made with blanked outlets and with a 6-in. run, being duplicates of the lower castings except for the flanged

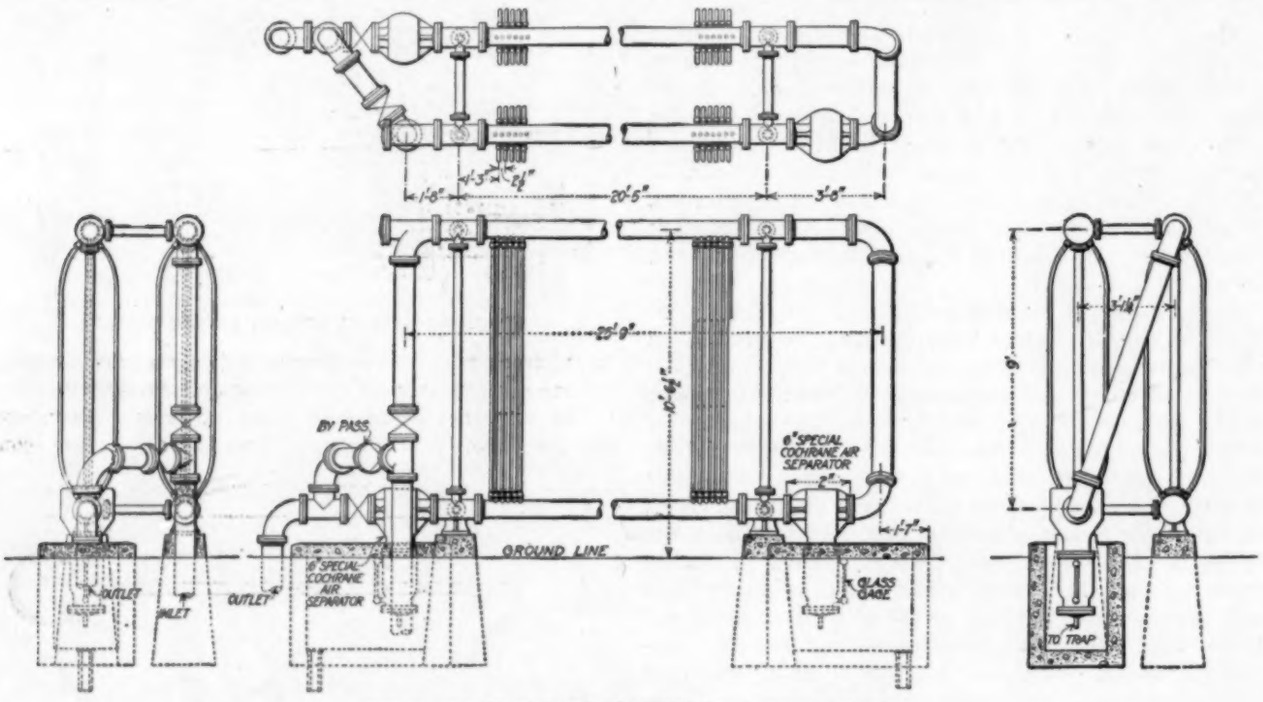


FIG. 3. PLAN AND ELEVATION OF AFTERCOOLER

base. Each pair of these tees is connected longitudinally both top and bottom by sections of extra-heavy wrought-iron pipe of 6-in. capacity, these pipes being drilled and tapped, as shown at *C*, for three ¾-in. nipples. These sets of three holes are repeated at a distance of 2½ in. between centers throughout the length of the 6-in. pipes.

The upper and lower sections are then connected together by means of suitably bent pipes and special unions as shown at *D*, there being 86 of these sets or groups of connections, comprising 258 pipes, upon each side of the structure.

Referring now to Fig. 3, which shows the completed structure in plan and elevation, the reader will notice that the air is delivered from the compressors through the upright pipe to one of the tees at the top of the structure flowing into the 6-in. horizontal pipe and thence through the bank of cooling pipes to the bottom of the section.

Passing out of the large pipe at the end of the section opposite its entrance, the air now passes through the first of the Cochrane separators and is then conducted by the diagonal pipe to the top of the second section.

In leaving this section the air passes through the second separator at the same end of the structure that it entered, but at the bottom of the opposite section, and is delivered practically dry and free from oil to the pipe line.

As shown in the drawing a bypass is provided by which the cooler may be cut out when necessary or desirable to make repairs.

Metric Taper-Pin Reamers

In answer to an inquiry in regard to standard sizes for metric taper-pin reamers inquiry brought out the fact that in most cases reamers of this kind were only made to special orders and in accordance with the customer's specifications. The Brown & Sharpe Manufacturing Co., however, has prepared a translation of its regular English taper-pin reamers from No. 0 to No. 14, giving the dimensions in metric measurements. The table here given is for the benefit of those who desire to use the metric system for this purpose in connection with their work.

TAPER-PIN REAMERS IN METRIC MEASUREMENT

Taper 2.083% = ¼ in. per ft.

Size Number	Diameter 6.3 mm. From Small End in Mm.	Total Length in Mm.	Length of Flutes in Mm.
0	3.43	58	38
1	3.71	68	44
2	4.11	76	50
3	4.65	88	58
4	5.28	98	64
5	6.10	112	74
6	7.09	142	98
7	8.41	165	114
8	10.11	190	134
9	12.24	220	156
10	14.76	245	175
11	17.93	288	210
*12	21.39	342	254
*13	25.63	404	305
*14	31.75	464	356

* Made to order.

Note.— Lengths and diameter are the same as regular taper-pin reamers, except sizes are expressed in millimeters.

An Industrial Democracy

By ELLSWORTH SHELDON
Associate Editor *American Machinist*

Among the many plans that have been devised for the purpose of bringing the employer and the employee into closer relation, interesting the latter in his work and clearing from the industrial pathway some of the difficulties which beset them both, Industrial Democracy, as described in this article, offers interesting possibilities.

AN INVITATION was recently extended to a representative of the *American Machinist* to attend the sessions of the Senate and the House of Representatives which together with the Cabinet form the legislative, or governing, body at the plant of Wm. De Muth & Co. located at Richmond Hill, N. Y. This firm manufactures a big line of French briar and meerschaum pipes and smokers' articles known under the triangle trademark W D C, the special machinery and processes involved requiring the services of about eight hundred people.

Recognizing the imperative need for closer coöperation between employer and employee the company about one year ago installed a system of organization government based on the principles of the Constitution of the United States and known as "Industrial Democracy." It provides that the legislative body, or Congress, referred to above has, with the confirmation of the Cabinet, the power to enact and enforce all laws, rules and regulations for the conduct of the factory, and its decisions are binding as well upon the company as upon the employees. The Cabinet is composed of members of the executive board, together with the factory and the sales managers, the president of the corporation being its presiding officer.

The Senate includes the superintendent, the heads of departments and the factory foremen. As this body already existed when the system was installed, the necessity for creating it did not arise, but the constitution provides that changes in the personnel of the factory executives or additions to their number may be made by the legislative bodies. Ordinarily if a new foreman were needed a candidate would be elected by the House, subject to the confirmation of the Senate and Cabinet, but if a man of special or technical training were required and such a man was not available among the employees the Cabinet would submit a candidate from the outside, subject to the ratification of the other bodies.

The House of Representatives is limited to 30 members who are elected annually at a mass meeting of the employees. As the number employed at present is about eight hundred, one member of the House therefore represents about twenty-five employees. To be eligible for membership the candidate must have three qualifications: First, he must have been in the employ of the company one year or more; second, he must understand and speak English; third, he must be known by all to be "on the square." In this application of democratic principles there is no question of equal suffrage as the gentler sex is well represented in both legislative branches.

Meetings of the three governing bodies are held regularly each week, the Senate being convened at 2 o'clock p.m. and the House at 3:30. The meeting place is a room on an upper floor of the office building far enough removed from the factory to avoid the noise and confusion. The Cabinet meets at 10 o'clock in the morning of the same day. Each house of Congress elects a chairman, or president, and a secretary who keeps a minute record of all proceedings.

Business is transacted according to the usual parliamentary procedure. Questions of wages, holidays, hours of work, benefits, etc., come under discussion; troubles or misunderstandings are brought to light and straightened out; new and better plans of operation are discussed and recommended—whether it be improved machinery, tools, methods or men, these bodies of Congress have the privilege of using and do use their brains in the interest of such better service. Committees are appointed by either branch separately or jointly, and there are standing committees on such matters as safety, suggestion, welfare, ways and means, etc., each reporting to its respective appointing body its findings, which are deliberated upon and if found feasible are recommended for enactment into law. A resolution by any branch, including the Cabinet, does not become law until ratified by both the other bodies, but when such resolution does become law it is considered a mutual obligation. Suggestions upon any pertinent subject may be made to the Suggestion Committee, which is empowered to make any award they deem suitable up to $5. If in its estimation a suggestion is of greater value it presents a resolution before the legislative bodies and the additional amount of the award is thus determined. Likewise the Safety and Welfare committees may order minor changes and improvements looking toward the safety of the employee and the betterment of his working conditions, reserving all matters of major importance for the action of the Congress.

How Dividends Are Paid

At the expiration of each two-week period the efficiency of the entire shop is determined by the relative value of its output to its cost of production; then an employees' dividend is paid, the basis of which is 50 per cent. of the savings accomplished during the two weeks by improved efficiency. If, as was the case when I was present, the dividend was 16 per cent., then each employee reecives in a separate envelope marked "Employee's Dividend," an amount of cash equal to 15 per cent. of the wages he drew for that two-weeks' period. The 1 per cent. reserved pays for an insurance policy on the life of each employee, and the face of that policy calls for an amount equal to the annual earnings of such individual.

To the leading department for each two-week period is presented a large American flag which is hung in the department, serving not only as an evidence of supremacy, but a constant incentive to further effort and an

emblem of patriotism. This flag, however, will not stay in one department without effort on the part of the employees thereof, as unless their lead in efficiency is maintained the flag will at the end of the period go to that department that has succeeded in boosting the record. The first department winning the flag three times is given a supper, the cost of which is liberally shared by the company and attended by the officials. This flag winning has created an active rivalry, as at present six different departments have each had it twice.

As a result of the location and the unsettled condition of the labor market the employees comprise a rather mixed nationality, and until recently the labor turnover at the plant, in common with many other industries, was such as to cause much disquiet, but since the installation of this system of shop government each employee realizes that instead of his being a mere cog in a wheel, to be used or dispensed with at some unknown person's convenience, he has become a useful and intelligent unit of the organization with a voice in its management, something to say about how long and under what conditions his best work can be done and how much he shall receive for it. This has the effect of increasing his self-respect and respect for his job, together with a sense of his personal obligation to his fellows. It is giving him an insight into the problems that harass his employers and it creates respect for them and makes him willingly share their burdens. Above all it awakens the sense of civic responsibility, inspires him to study our language and our customs, and in that way strikes a blow at what is perhaps the most insidious evil at the root of our republican form of government—the ignorance and indifference of the individual of and to the things that are of vital importance.

The System Teaches Americanism

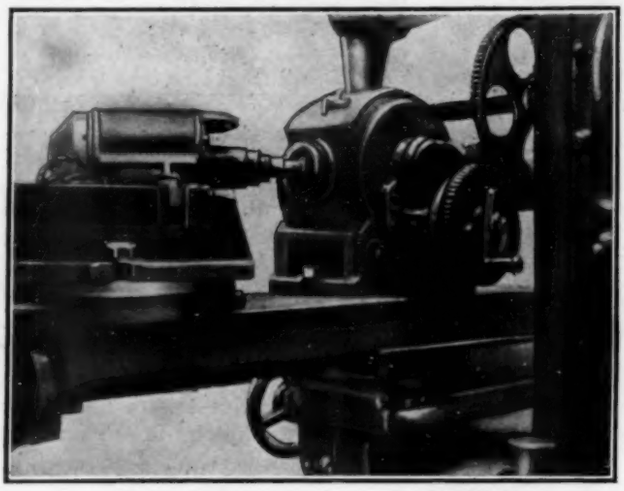
The following is an instance of the way in which the system teaches Americanism. A resolution was introduced and passed in the Congress naming certain days as holidays, and though this list was made up by a body two-thirds of whom were of foreign birth, every day named was strictly an American legal holiday. If an employee should remain away from the factory any day not included among the holidays appearing on the accepted list without reasonable excuse he loses one quarter of his dividend; if two days he would lose one-half, three days, three-quarters, and if four days he would lose the entire dividend for that period; that is, if he lost four days out of a possible 12 he would lose the dividend that would accrue during the 12-day period. The object of this somewhat drastic penalty is to avoid low production and running the shop shorthanded, which obviously would cut down the surplus available for dividends, and as it applies to everybody, it is therefore fair to all.

The system was installed by Albert J. Leitch, of Philadelphia, who is an enthusiast on the subject of cooperation. Mr. Leitch does not claim perfection for his method, but he says that it is, like the American Government, the best there is, and though it has been in operation only a year in the Demuth plant it has already produced substantial results and its advantages are growing more evident each day not only in increased financial returns, but in smoother production.

Grinding Index Head Centers

By Oscar Craft

The illustration shows the method used for regrinding the centers of the dividing head when they have become worn. The head was so arranged upon the table of the milling machine that the center could be



GRINDING DIVIDING HEAD CENTERS

revolved by means of a gear mounted upon the arbor of the machine driving through the bevel gear worm and wormwheel of the dividing head.

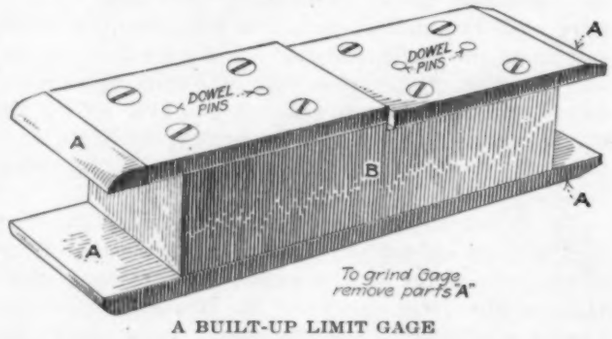
The grinding was done by a toolpost grinding machine held in the milling-machine vise, the latter being set to an angle of 30 degrees.

The only thing not fully explained by the picture is the method of feeding in the wheel for successive cuts, and this was accomplished by leaving the holding-down bolts of the vise loose enough so that the latter could be tapped along lengthwise of the table with a lead hammer.

A Built-Up Limit Gage

By Henry P. Boettcher

The cut shows a limit, or snap, gage which can be very easily and cheaply made and kept in repair. The central part, or body, *B* is first finished accurately to



A BUILT-UP LIMIT GAGE

the desired measurement, and the parts *A* having the inner surfaces ground and lapped smooth are fitted and held in place by flush head screws passing clear through.

When the gage becomes worn all that is necessary to restore it is to remove the loose parts and straighten their inner surfaces on the lap.

XI. The Bolt and Feed Operating Stud—II

This section describes the finishing of the bolt and the work of turning, threading, shaving and cutting off the studs. Two studs are put through at one time on opposite ends of a F*-in. length of steel, thus permitting the short lengths to be conveniently handled. As they approach completion they are cut off for finishing the ends.*

ANOTHER fixture which is used in working out the cam slot in the bolt is shown in Fig. 93. This cam slot has to be produced with extreme accuracy because it is one of the factors upon which depends the proper functioning of the gun. The exact angle desired, the length of the slope, the start and finish of the slot have each been determined with due care. The factory is held to close limits in the production of this slot, as may be supposed from the character of the testing fixture operation already illustrated in connection with the straight profiling operation described in the first installment of this article.

The fixture for milling the helical cam surface is also an attachment for a hand-milling machine, and the body is a barrel with a controlling cam groove in its periphery to give it the desired helical movement when advanced in its bearings. The central portion of the barrel spindle is hollow and cut away to form an opening in which the gun bolt is chucked in the manner represented. The actual process of finishing this sloping cam slot is accomplished in two machines, one of them taking the cut along the right side of the slot, the other finishing the left side. In this way the highest degree of accuracy is obtained as to width of slot and angle of cam portion.

The rotary motion of the spindle necessary to traverse the work past the cutter in the angular path of the helical cam is derived by pulling the handle on the top of the spindle, while the longitudinal movement is accomplished by means of the handwheel and screw at the rear end of the fixture.

The movement forward or back of the work-carrying spindle is limited by two adjustable stops which are seen at the right and left of the upright, or turning handle.

The cutting tool used is a straight-fluted routing mill carried in a draw-in collet in the spindle of the machine. It must run perfectly true so that there will be no irregularities or chatter marks in the angular surface milled.

The Cam-Slot Gage

Not the least interesting feature of this operation is the gage used, one each for the right and left side cuts. One of these devices is shown standing on the end of the milling fixture. It is essentially a flush gage with three pivoted arms bent into hooked contact points to touch three certain points on the cam slope, and when the milled bolt is slipped into the device. The work is not shown in place in this gaging fixture because it would obscure the ends of the gage levers and thus defeat the purpose of the illustration, which is to show the application of the device. The bolt rests in a seat in the base and is located in the same manner as for previous machining cuts. The gage arms are positioned to touch three certain points on the cam slope, and when in contact with these points, if the cam slot is quite correct, the upper ends of the arm will come flush with the corresponding shoulders finished on the projecting gage plate at the top and left side of the fixture. A deviation of one thousandth of an inch or even less can readily be detected when a finger or thumb nail is passed over the joint betwen the gage fingers and flush

plate. A similar device, but on the opposite hand to the one shown, is used for gaging the opposite edge of the cam slot.

There is a fixture used in connection with Operation 46 which is of unusual interest. This is complete in itself and is operated entirely by hand. The work performed is the shaving of the thread shoulders to gage on the right and left sides, these shoulders having been already roughed down to approximate form by a regular milling process. The shoulders are finished in the form of a pair of threads or helixes projecting from the rear end of the bolt body, and they are really an extension (at least one of them is) of the internal thread milled for the reception of the feed-operating stud, as explained before in this series.

Here, as in previously used fixtures, the bolt is positioned by resting it on its cylindrical body, and is located endwise against a stop plate contacting with the rear face of its lugs, its position with reference to rotation about its axis being fixed by an opening in the stop plate which receives the locating lug on the bolt.

This stop plate is shown at *A*, Fig. 94. At *B* is seen the hook bolt which secures the work in its seat in three half rings *C*. Now, positioned and secured for the shaving operation, the bolt is directly opposite the two cutting tools *D* in separate and independently adjustable tool slides *E* carried on the common slide *F*. This construction provides a form of compound rest without the swiveling feature of the usual top slide, but provides for independent or joint movements of the tool slides proper either in conjunction with the lower slide or by separate adjustments of their own.

The cutting edges of the shaving tools are directly opposite one another on the horizontal center line of the work. The tools are of square section and are secured in special holding blocks, details of which are shown in the illustration. The rear end of the spindle has a large threaded portion cut with four threads per inch to correspond with the pitch of the thread shoulders on the end of the bolt. The spindle is provided with a handle by which it is oscillated to and fro to pass the work by the cutting edges of the tools, and after each return stroke the shaving tools are moved forward by the feed-screw handle in front of the main tool slide.

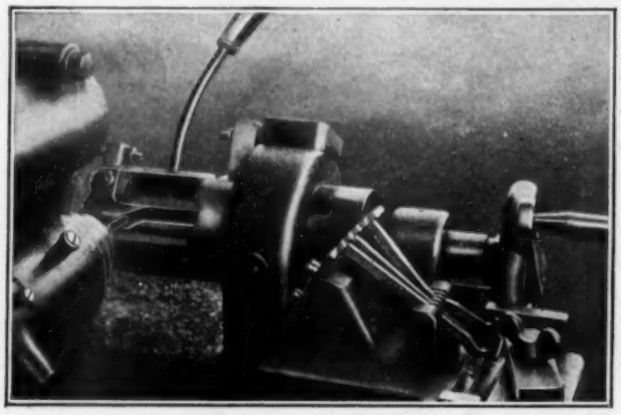


FIG. 93. MILLING THE CAM SLOT IN THE BOLT

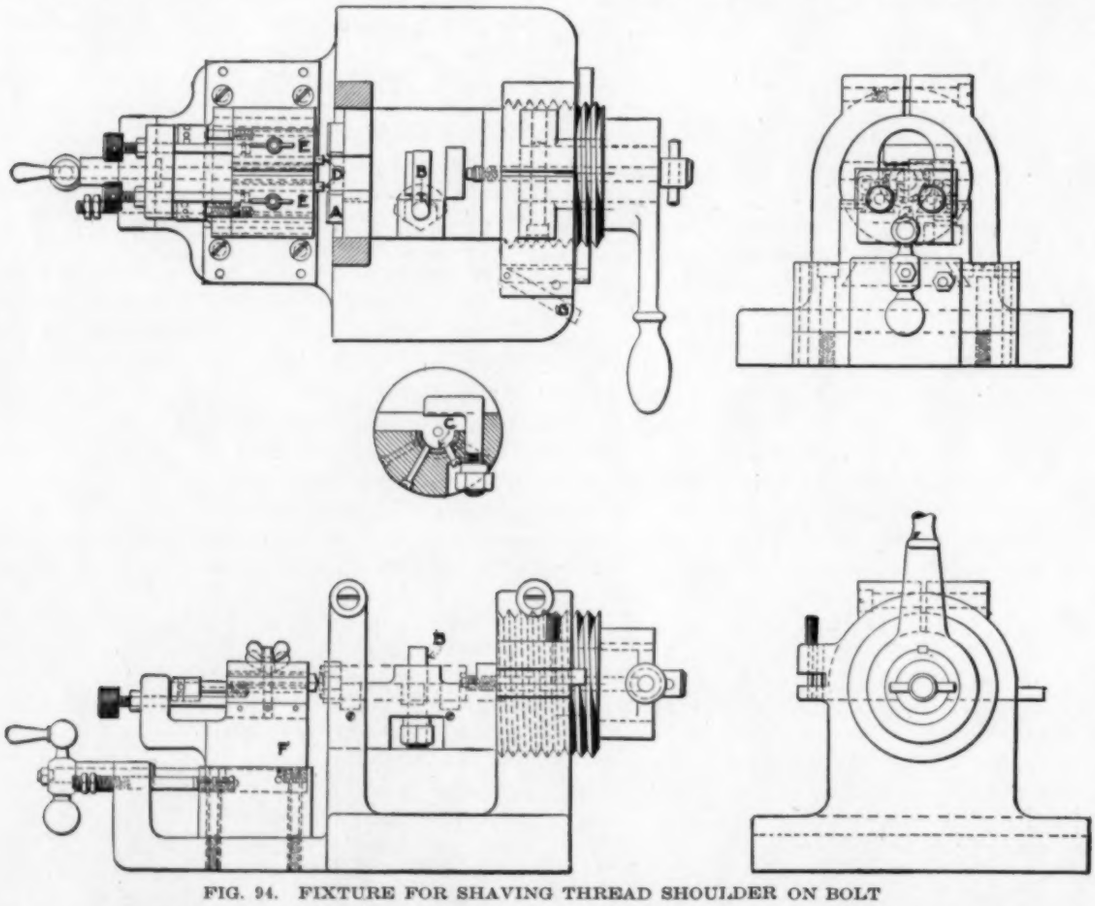


FIG. 94. FIXTURE FOR SHAVING THREAD SHOULDER ON BOLT

The upper slides for the toolholders having separate movements by means of independent adjusting screws

may always be regulated to give the tools the same depth of cut. In shaving these thread shoulders down to finished size they are tested with gages which show if the two shoulders correspond in all respects; each shoulder is also inspected separately to determine if the gage when applied will screw up to the exact point required on the bolt, and after that the two thread shoulders are tested together with a gage that must screw into the bolt thread and draw up snugly and in full contact along the whole length of both outside thread shoulders, or, in other words, exactly as the feed-operating stud must act when assembled in the bolt and put into actual service. The system of independent adjusting screws for the tool blocks is well brought out by the drawing and needs no special explanation. Such is also the case with the stop screw and nuts by which the forward position of the tool slide is limited as required to bring the thread shoulders to necessary depth. The stops for the rocking or oscillatory motion are also shown distinctly, and it will be observed that the front stop *G* is pivoted at the end so as to be swung out of the line of travel of the stop pin in the spindle when it is desired to rotate the latter way around, as when setting up, adjusting cuts, etc.

FIG. 95. PLUGS FOR GRINDING BOLTS

There are a number of important and distinct operations that follow this thread shaving at the end of the bolt, including the hardening of the work preparatory to grinding, and immediately before the bolt goes to the cylindrical grinder for Operation 53 to have its body brought to finished size the firing pin hole is lapped out. For this process a series of center plugs, Fig. 95, are provided to slip into the ends of the bolt, the diameters of these centers varying throughout the series. From these different sizes a pair of plugs may be readily selected which fit the firing-pin hole and the large hole at the rear end of the bolt. The work is then placed between centers in the grinding machine. The large plugs *A* are made with a long head, and integral with them are a pair of wing projections *B*, which engage with the bolt lugs and serve as a driver for the work.

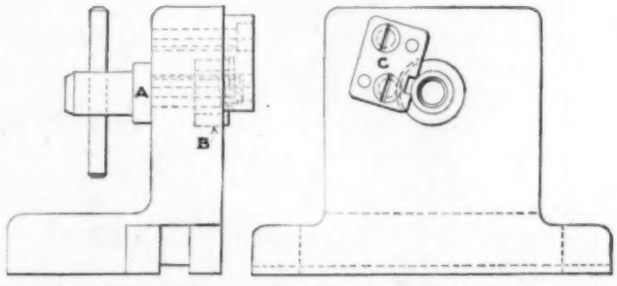


FIG. 96. FIXTURE FOR GRINDING CARTRIDGE SEAT IN END OF BOLT

The fixture, Fig. 96, for Operation 62 is for grinding the cartridge seat in the front end of the bolt. The bolt is drawn back against a stop ring at *B* by a threaded spindle *A* which enters the square thread milled in the rear end of the bolt.

The bolt is positioned to allow the grinding wheel to enter the clearance gap cut in the front end by the setting plate *C* with its notched edge which receives the bolt lug and so establishes the correct location.

Turning back to Fig. 84 in the preceding installment and examining specifically the bolt at *E* in the group, the feed-operating stud will be noticed in position in the threaded end of the bolt. The parts at the front represent some of the progressive stages in the manufacture of this feedoperating stud, and at the right lower corner are two finished studs, which with the detail drawing, Fig. 97, should make the design of this important part clear. The order of operations followed in manufacture is covered by the schedule, which comprises altogether 28 different operations.

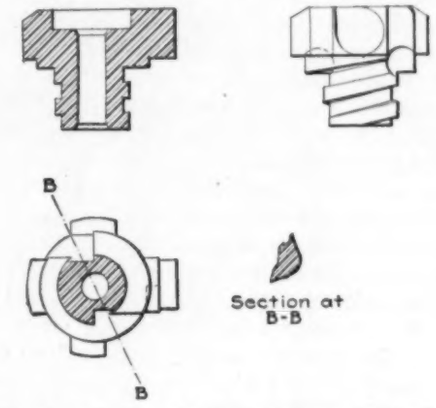


FIG. 97. DETAIL OF FEED-OPERATING STUD

SEQUENCE OF OPERATIONS ON FEED-OPERATING STUD

1. Turn outside diameter to rough size and cut off 6 in. long.
2. Burr ends on emery wheel.
3. Mill driving slot for grinding.
4. Center ends for grinding.
5. Grind outside to size.
6. Form thread end and locking shoulders.
7. Mill locking lugs (rough).
8. Remove burr left from previous operation.
9. Shave locking lugs (rough).
10. Shave locking lugs (finish).
11. Finish locking lug opposite operating lug.
12. Mill thread stop shoulders.
13. Mill square thread and first locking shoulder.
14. Mill second locking shoulder.
15. Mill off end of thread.
16. Shave thread and locking shoulders.
18. Profile operating lug.
19. Cut off from holding stock.
20. Remove burr left from previous operation.
21. Spot, drill and ream hole, counterbore, countersink.
21½. Grind back of stud.
22. Mill bevel on locking lugs, rear end.
22½. Profile ejector clearance on lug and cam surface at rear end.
23. File between lugs and sides of lugs.
24. Finish square thread with hand die, file locking shoulder.
25. Corner stud, countersink and fit gage to operating portion.
26. Harden.
27. Sandblast.
27½. Polish.
28. Inspect, assemble and inspect.

The operation sheet starts with the turning of the outside diameter to rough size and cutting off to 6 in. in length in the turret lathe. The finished stud is less than 1 in. in length, but the 6-in. length to which the material is cut is to allow a stud to be formed on each end and then cut off, thus facilitating the general conditions of handling the short work. After the ends of the 6-in. length have been burred on the grinding wheel a slot is cut in the end to form a driving slot for a grinding operation, which takes place as Operation 5, after the centering of the ends, and accomplishes the grinding of the outside diameter to size. This slot is noticed in the ground 6-in. length at *G*, Fig. 84. The next operation, No. 6, is the forming of the thread end and locking shoulders *H*, in the turret lathe, followed by a milling process which roughs out the lock-

ing lugs at *I*. These lugs are later sized to finished dimensions by a shaving process. Then the thread stop shoulders (see detail Fig. 97) are milled, the square thread and first locking shoulder milled, the second locking shoulder milled and the end of the thread milled off. These operations are all attended to with precise methods and fixtures, and being closely analogous to the similar cuts on the rear end of the bolt need not be described here. Now we come to the shaving of the thread and locking shoulders in Operation 16, which is accomplished with the aid of the bench machine, Figs. 98 and 99.

The spindle has a type of work-holding device similar to others employed on some of the bolt processes, and is also provided with the four-per-inch thread at the rear end which serves as a lead screw for advancing and withdrawing the work in respect to the tool, thus moving it along in a helical path. A crank handle at the end forms a medium for rotating the work spindle and the distance through which the spindle revolves is determined accurately by a pivoted stop at *A*, Fig. 99, which is engaged by a projecting stud fitted crosswise into the outside of the spindle. The work is seated in the spindle carrier with its shoulder against a stop plate at the front at *B*, and this plate further serves as a setting gage by virtue of a rectangular notch, or opening, which receives the operating lug on the head of the machine base. The slide is operated by a screw and ball handle at *C* to feed the tool to the cut. It is adjusted toward the spindle end in a direction parallel to the axis of the spindle by the feed screw *D*. The top slide

FIG. 98. SHAVING THREAD AND SHOULDERS ON STUD—TWO STUDS SHOWN ON ONE PIECE

and its screw are limited in their advancing movements by stop screws and nuts placed in the conventional manner illustrated. The lower slide, which controls the position of the tool sidewise (hence the endwise position of the thread on the stud) in relation to its shoulder, is

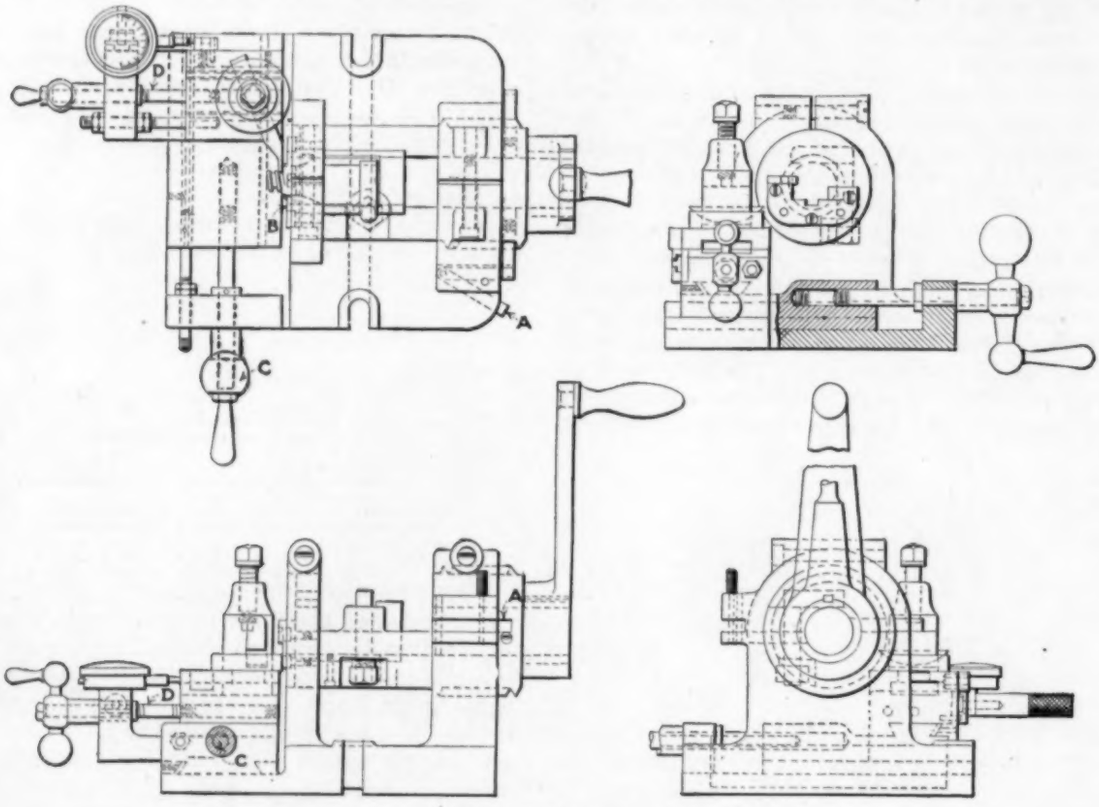


FIG. 99. HAND-SHAVING FIXTURE SHOWN IN DETAIL

stud, so that the thread-cutting cycle commences with the end of the thread started to correspond with the internal thread of the bolt so far as concerns the relation of this thread to the corresponding lugs.

The thread-shaving tool is an offset square-point tool which is carried horizontally in a holder on the cross-slide mounted on the main slide which is fitted to the controlled by means of the dial indicator shown to the rear of the slide. This provision makes possible the very accurate location of the thread, which has already been milled as referred to and is here finished by shaving. Also the locking shoulders are shaved to the desired form at the same setting, the helix being uniform with the thread.

This work is held closely to requirements by application of complete gages for testing the cuts so that the matching surfaces on the stud and bolt will correspond exactly with each other.

One more illustration will be included in this article as characteristic of a number which cannot well be described separately at this time. Fig. 100 represents clearly the profiling of the operating lug on the stud, which is accomplished in Operation 18. This lug, as may be gathered upon examining the detail, Fig. 97, is in the form of a cam and the contour is produced with the profiling cutter through the medium of guide plates like the one shown under the guide pin in the profiling machine head, which permits the taking of both rough and finish cuts on the piece at the same setting of the machine.

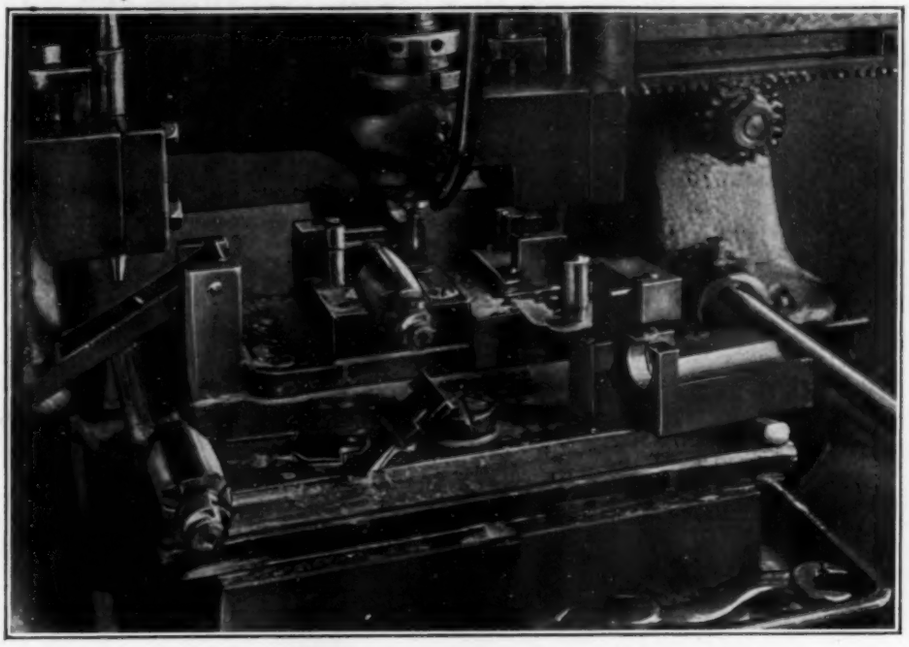


FIG. 100. PROFILING OPERATING LUG ON FEED STUD

The work is held in an open seat in the fixture with a swinging clamp over the top. The snap gage for the lug, in the form of a limit gage, is shown on the front of the profiler table, and at one side is a fixture for gaging the position and height of the lug, the plug on the top being of the flush-pin order, while the sides of the lugs are gaged in the open jaws cut out at the front end of the device. The work may now be cut off from the original 6-in. length of material, the burrs removed, the center hole spotted, drilled and reamed, counterbored and countersunk, a sequence requiring three distinct operations. Then the back of the stud is ground off, the rear ends of the locking lugs beveled to the specified angle, and the ejector clearance profiled on the lug and on the cam surface at the rear end, this advancing the work to the twenty-third operation. A few simple applications of hand tools follow the above operations before the stud is ready for hardening and sandblasting operations performed on it.

After the latter is attended to, the work is polished and then goes to the inspection department, where it is examined and gaged preliminary to being passed for assembling in the gun.

Grinding 6-In. Shell-Boring Cutters

By George M. Dick

In the manufacture of munitions the problem of maintenance of cutting tools assumes serious proportions, and there are many and varied fixtures and devices in use for grinding them without changing the form of their cutting edges.

One of the units of the tool equipment of the munition manufacturer most difficult to maintain is the double-faced boring cutter which is used on the finishing cuts taken from the interior of shells, and perhaps the most troublesome portion of this cutter to hold to form is the radius of the junction of the parallel and the tapered bore.

There have been illustrated in mechanical publications various types of fixture for special cutter-grinding operations, but the writer does not remember having seen anything to cover this point. The illustrations herewith show a fixture which the Canadian Ingersoll-Rand Co., Ltd., of Sherbrooke, Ont., Canada, has had in successful use for some time for grinding cutters used on 6-in. shells, and which may be of interest to other manufacturers of a similar product. There are two principal parts: the lower part or base *A*, in the illustrations (Figs. 1 and 2), having a rib on the under side to fit the slot in the cutter-grinding-machine table and means provided for bolting it down, and the upper part *B*, which is swiveled upon the base, the point upon which the movable part swings, when considered in relation to the point of contact between grinding wheel and cutter, being the center of the radius upon which the cutter is to be ground.

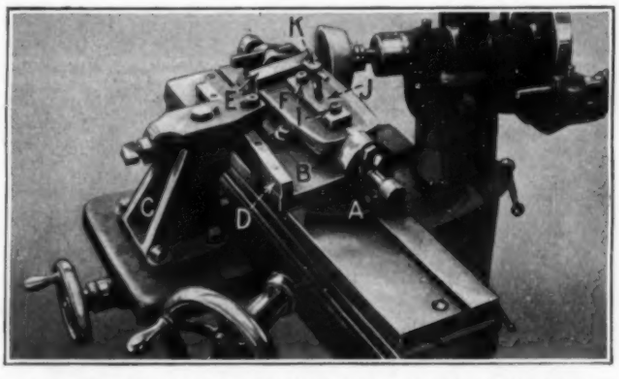


FIG. 1. GRINDING FIXTURE FOR BORING CUTTERS

A bracket *C* is bolted to the cross-slide of the machine, this bracket carrying rollers which operate the swiveling table through the cam *D*, which is firmly attached to the front of the latter. The upper part of the bracket is made in a separate piece to provide ad-

justment between the cam rollers, enabling the operator to set them in such manner as to allow the cam to pass freely and accomplish the turning movement at the right moment without either backlash or binding.

The top plate *E*, which holds the cutter *F*, is made separate from the swiveling table *B*. This table has a T-slot running longitudinally through its center and a block *H* (Fig. 2 only), sliding in this slot, carries two studs *I* passing through the top plate and through the holes in the cutter to be ground. These studs have a groove near the top enabling the slip plate *J* to be

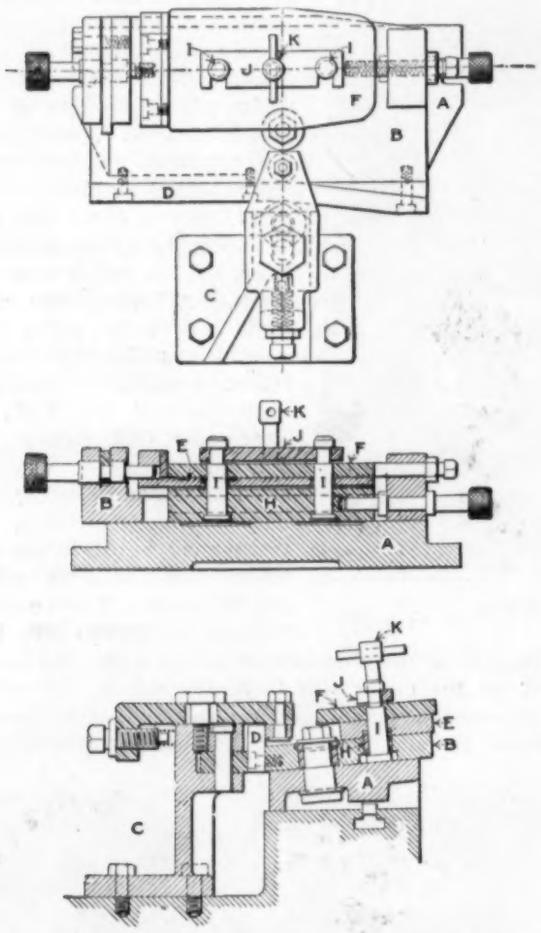


FIG. 2. ASSEMBLY DRAWING OF FIXTURE

pushed into place and the cutter clamped by means of the clamping screw *K*. This arrangement allows the cutter to be quickly placed and removed, and also provides adjustment endwise to the cutter to compensate for wear of the latter.

The cutter *F* is accurately positioned upon the top plate *E* by means of the studs above mentioned, and by abutment screws passing through the upright part of *E* bearing upon the end of the cutter. The top plate is adjusted upon the swiveling table with reference to the condition of the cutter being ground. The cutter is then placed in position, ground upon one side, reversed and ground upon the other side, thus producing a symmetrical form. By using a convex-faced grinding wheel and lowering the table of the grinding machine the lip of the cutter may be readily ground.

Indexing to Fractional Parts of Minutes

By D. E. Mapes

Recently I had a piece of work which required exceptionally close indexing, but our dividing head was not equipped with a micrometer adjustment to index to seconds. The nature of the work was such that we could not use differential indexing, and in this particular case compound indexing was not practical either.

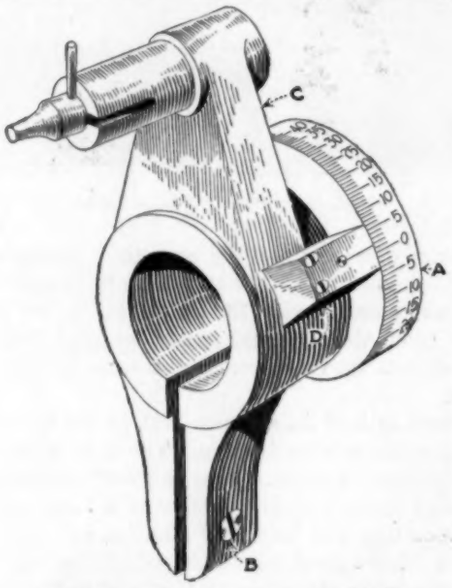
After much figuring and many suggestions a practical idea was worked out so that we could index to 15 sec. or less without great trouble.

I am not claiming to have originated this idea, but to have made an improvement over the original which we used on the job.

The sketch is almost self-explanatory. On this dividing head, which is a well-known make, the bracket *C*, which holds the index plate from turning when the latch pin is engaged, is movable through an arc of more than 180 degrees.

Plate *A* is removable by taking out three screws. This plate *A* is to have graduations of 540 divisions cut on its periphery which needs to go only about halfway around, and for convenience every fifth line to be cut longer than the intermediate lines.

One revolution would be 540 min. if the bracket was free to turn, therefore each line would represent 1 min.



DEVICE FOR PRACTICAL INDEXING

With the use of a magnifying glass it is a very easy matter to get ½ min. or less.

To use this is simplicity itself. Example: Index 8 deg. 45 min. 40 sec. Reduced to seconds is 31540 = 0.97345 turn of crank. Our next lowest figure, as from the chart in the "American Machinist Handbook," page 790, is 0.9730. This is equal to 31,525 sec., or a difference of 15 sec. To use this device it is only a matter of getting a long line to coincide with the line on block *D*, adjust sector arm to proper circle for 0.9730 turn. Index the 15 sec. first by loosening clamping screw *B*, and move bracket *C* in the same direction as the crank is to be moved, ½ line or 15 sec.; tighten screw and proceed with regular indexing. The block *D* is made to come level with plate *A*.

The Rising Cost of Machine Building

By LUDWIG W. SCHMIDT

During times like the present when values change frequently, it is of great importance that the national industries should be operated with more than ordinary care. The principal aim must be to keep cost and earnings in proper proportion. The first should not be allowed to encroach unduly on the second, and the second should not be excessive. This is of special importance in the machinery industry, which supplies the tools needed for the operation of all other industries.

IT IS of great interest to note how the machine-building industry has fared during the first year since the war spread to this country. An attempt is made in the following to inquire into the working cost of the machine-building industry and especially to find out how it has been influenced by the general rise of prices which has been such an astonishing characteristic of our industrial life during the last year.

To make this inquiry as conclusive as possible the fundamental factors controlling cost of production have been selected instead of using the example of one or more representative enterprises. The first method has the advantage of producing an average result descriptive of the business of the whole of the nation's machine-building industry, while the second must rely for its conclusions on facts produced inside the narrow limits of a few factories which may have been especially favored (or suffered, as the case may be) by present conditions.

The price of a commodity is determined by these factors: Cost of labor, cost and quantity of materials, manufacturers' profit surplus above the first and second. If wages rise in a certain industry there must be a corresponding rise in the cost of production of that commodity. If the cost of materials fall during the same time, the rise in the cost of labor may be equalized by the decline in the cost of materials. Should both rise in price, or one remain at its former level while the other rises, the cost to the manufacturer increases, and the manufacturer will either have to reduce his profit margin or increase the factory price.

The rise in the cost of labor in the machine-building industry has been nation-wide; so has been the increase in the cost of the most important materials used. It is therefore certain that both must have made a serious inroad on the profits of the industry. Has the increase in cost of labor and price of material affected seriously the cost of production in the industry during the last year? is the first question to be decided. Second, Has the advance in cost of manufacturing been accompanied by an increase in the sales prices of machinery in this country to compensate the manufacturer for his increased outlay in the first respect?

As it is not easy to give a clear-cut answer to both questions, the facts are here given as they have been deduced from United States Government and other statistics collected by the writer during the last year.

The rise in wages necessarily must have a considerable influence on manufacturing cost. During the past year wages have risen not only in the machine-building industry but also in all others upon which it depends for material. The United States Bureau of Labor Statistics, which has published since 1915 an index figure dealing with employment and wages in the iron and steel industry, indicates an increase of 22 per cent. in the per capita wages paid in the iron and steel industry during the year 1917. A survey of the wages paid to workers in machine shops made by the author and based on figures published by the New York State Department of Labor shows that wages in this branch of the industry rose 13 per cent. during the year. During the first four months of the year wages kept fairly steady, but in May they increased 2 per cent. over January; June and July showed an increase of 3 per cent., and August a further increase to 4 per cent. over January. During September, October, November and December increases were 7, 10, 12 and 13 per cent. respectively.

An Important Factor

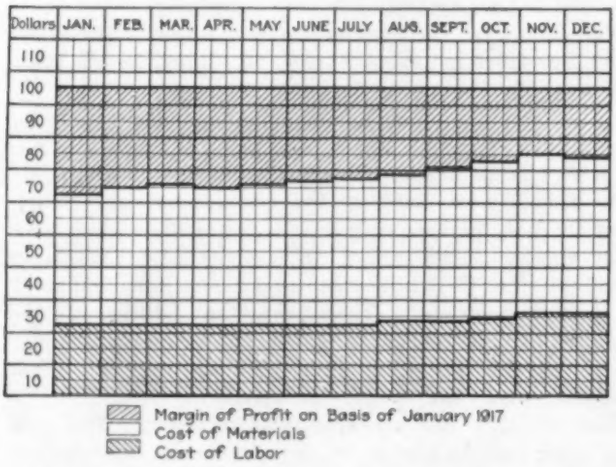
Labor is an important factor in cost accounting. Of the $685,000,000 paid by the machine-building industry in 1914 for materials and wages, $280,000,000 were for wages. This is $28 on every $100 of machines sold by the United States machine-building industry at factory prices. These are the figures of the United States census of 1914. Like all census figures of this character they give an average result spread over the whole industrial group; in this case foundry and machine-shop products. The cost of labor may be higher in some instances and lower in others; as an average, however, these figures may be used to show how the wage increase has changed it during the last year. Machine shops that paid during January, 1917, $28 in wages to produce a unit of goods then valued at $100 had to pay $28.56 in May to make the same unit. The cost of labor rose during June to $28.84 and remained the same during July. In August $29.12 had to be charged to labor account, and $29.96 during September; $30.80 was paid in October; $31.36 in November and $31.64 in December.

While it is not very difficult to recognize the part played by wages in the rise of manufacturing cost it is more difficult to assign the same responsibility to the other factors grouped by the census under the head of materials. According to the census figures of 1914 $405,000,000 were paid for materials by the foundry and machine-shop industry, or 41 per cent. of the total value of the production of the industry at factory price. This amount paid for materials on every $100 worth of production seems a rather low figure at first glance; therefore, it is necessary to know exactly what is understood by materials. The explanatory notes of the census report say it should be understood as referring "to all materials and mill supplies of every description, whether raw or partly manufactured, or whether entering in the products, used as containers, or consumed in the process of manufacture, and all

fuel, whether used for heat or power or in process of manufacture. The cost of materials produced in the plant itself and used by it for further manufactures should not be duplicated."

The latter sentence probably explains the comparatively low outlay for raw materials shown in the census report, as of course many of the minor machine parts are made in the factory. The report, however, includes all money paid for fuel, as coal and power, under the subheading of materials, which makes it necessary to inquire also into the rise of cost of this item, which, as every machine-shop manager knows, is not always easy.

If it is taken for granted that 41 per cent cent. of the factory value of every machine sold represents approximately the correct cost of materials used it will be necessary to see how far the change in price of all those materials entering the manufacture of a machine will have influenced this item of cost during the last year. Three lines of inquiry seem to suggest themselves. The



RISE IN COST OF LABOR AND MATERIAL DURING 1917

first as to the cost of iron or steel as the principal raw material used; the second as to the rise in the cost of power production and the third as to the effects of the general price situation on the cost of all general supplies.

It is unfortunately difficult to obtain data covering each of these items correctly. Every machine-shop manager knows only too well that he has had to pay more for nearly every item, but probably only a few have kept accounts so closely as to be able to give the manufacturing cost after each increase in price.

To begin with pig iron there are a number of agencies that publish price quotations, and to get a ratio in this case the average export prices published by the Department of Foreign and Domestic Commerce have been selected. These during the year show on the basis of 100 as the index figure for the price paid during January, 1917, the following movements: February, 106; March, 108; April, 105; May, 104; June, 106; July, 100; August, 100; September, 116; October, 118; November, 120, and December, 118.

The index figure for steel made in the statistical bureau of the writer on the basis of the cost of steel billets at Pittsburgh, starting with 100 for January, 1917, shows the following erratic movements: February, 108; March, 108; April, 125; May, 133; June, 166; July, 166; August, 141; September, 108; October, 91; November, 79, and December, 79. Steel prices, therefore, while high during the first half of the year, went down again during the second.

On an average there has been through the year a rising trend in the cost of the principal raw material, which has influenced manufacturing cost to a great extent. Not only has there been in evidence an increase in the cost of each machine part manufactured in the plant but each article purchased had to be bought at a higher price than during the preceding year. This is especially noticeable with minor parts, such as nuts, bolts and others, the price of which on the basis of the average export price was exactly 33 per cent. higher during the year 1917 as against 1916. It is therefore probably safe to say that the price of most of the general supplies has increased at a rate varying from 25 to 40 per cent. during the last year.

Inquiring, finally, into the cost of power and fuel this seems to have varied a good deal according to district, cost of transportation and method of production. It is certainly a conservative estimate to set down the average increase in the cost of power production at 6 per cent.

A careful analysis of all the factors governing cost of materials during the last year indicates the following movement on the basis of 100 for January, 1917: February, 102; March, 104; April, 102; May, 105; June, 107; July, 108; August, 111; September, 115; October, 117; November, 122, and December, 118.

Values of Material

If materials valued at $41 were needed to manufacture a certain unit costing $100 at factory price on Jan. 1, 1917, the price of the same unit in February was $41.82; in March, $42,64; April, $41.82; May, $43.05; June, $43.87, July, $44.28, August, $45.51, September, $47.15; October, $49.75; November, $50, and December, $48.38.

An increase of 13 per cent. in the cost of labor and of at least 20 per cent. in the cost of materials during the course of only 12 months, of course, must have a material influence on manufacturing cost. It has grown during the whole year from month to month, with the exception of April when a small decline seems to have taken place, which however did not continue, and was followed immediately by a further increase in May. The chart gives an impression of the influence exerted by both factors on the manufacturing cost in the machinery industry.

If the machinery unit that has been used so far for the purpose of explaining the different changes could have been manufactured at a cost of $69, including materials and labor on Jan. 1, 1917, it would have cost to the factory $69.82 during February of the same year, and $70.64 during March. During April there was a return to the cost of February, but in May manufacturing costs rose to $71.61, during June to $72.71 and during July to $73.12. In August it had reached $74.63, in September $77.11, in October $78.77, in November $81.36 and $80.02 in December. Consequently the manufacturer selling this unit for $100 all the year round would have had left during December, 1917, only $19.92

to pay for all his overhead expenses and new equipment; certainly not enough to pay for his own upkeep.

It is clear that less than 20 per cent. margin between cost of manufacturing and factory selling price is not sufficient to cover the remaining expenses, though opinions may differ in this respect. One manufacturer may think he can do with less while another who is more cautious would not sell below 40 per cent. of the sales price. If the census figures can be trusted most manufacturers in this country believe that at least 30 per cent. will have to be charged; the exact average for the year 1917 is 31 per cent. This seems to come nearer the truth. Adding this percentage to the manufacturing cost established for the last year by the preceding method it would appear that a machine unit costing $100 on Jan. 1, 1917, should have cost at least $115 during December of the same year.

The Increased Factory Cost

It is a question, however, whether even such an increase in price would have covered fully the increase in factory cost not contained under the classification labor and materials. Most machine shops have been compelled to expand during the last years, owing to the rapid increase of work. This increase has not been accomplished without additional outlay for building and machinery. Considerably more had to be paid for this additional equipment than in former years. The same factors which have helped to increase the cost of production generally in the machine industry must have acted also to increase the price of the new machinery bought. New equipment, whether it was additional or simply to replace worn-out machinery, has in this respect added to the cost of running the shop, making a corresponding inroad in the margin of profit.

Doubt exists whether under present conditions a machine manufacturer acts wisely to cut his profit margin too narrow, and it is questionable whether even 30 per cent. of the factory sales price can be called a safe margin. This seems to have been fully realized in the machine-building industry, and it appears that most factories have added an additional 3½ per cent. to provide against any undue incident. This precaution should be sufficient to protect the industry in case of further unexpected rises in the cost of labor or materials, and it seems that during the last year at least the machine-building industry has been running on fairly conservative lines. This policy, if kept up during the period of war, should secure to the country the safe operation of an industry so closely connected with the successful conduct of the war.

Whom Are We Fighting?

By Entropy

In the heat of the conflict it is easy and natural to think of our enemy as being the one most in evidence and shooting the most bullets. As we think more carefully, however, it appears that we are really fighting many who think they are on our side and who would be most amazed and hurt to be classed as enemies.

We are fighting not merely to conquer Germany and her allies, but for the good of democracy—"to make the world safe for democracy," as President Wilson has stated it.

Democracy is by no means confined to nations. Democracy means a square deal for everyone and the right to be heard before a decision is reached as to what is a square deal. It applies as much to our shops and our commercial life as it does to Germany. The only difference is that Germany went so far and became so powerful that it must be pulled down from its high horse.

Most of us can think of at least one example of some employer, or more often his representative, who ought to be pulled down from his high horse. Of course in this and all other civilized countries we do not do this by force, but by reason and pressure of public opinion. Public opinion is forming fast, but it does not yet know what direction to take. If anyone wants to know whether this opinion will ultimately direct itself at him, all he has to do is to ask whether he preaches and, more important, practices democracy in his dealings with everyone else. Of course if he preaches one-man power in his shop and insists on direct military control without let or hindrance; if he counts every man that is on his payroll as "his man" and threatens vengeance on whoever would "steal" him; if he tells his customer that if he does not like the treatment which he gets he knows where he can go; if he will not hear the other side of the case, no matter how much his experience and faith may teach him it is wrong, then he had best mend his ways if he would not have public opinion unhorse him.

Why Workmen Appear Ungrateful

We talk of the ingratitude of the workman who has labored for years for one employer, but who, in spite of ties of friendship, cuts loose and goes to some other job which pays him twice or three times more than he ever hoped to get; talk of the lack of patriotism of the man who leaves a shipyard to work in a munition plant, or vice versa, for more money; but we hate to get together with ourselves and face the reason why men will not stay with us longer than to get enough money to travel along. We pat ourselves on the back and borrow money from the bank to buy Liberty bonds and subscribe to Red Cross appeals and think we are the last word in patriotism, and then plan how we can take the money away from customer or workman, or both, without their noticing it.

Perhaps we do do these patriotic things, and perhaps we give freely of time and money and send our sons to the trenches with a stiff upper lip, and yet our superintendents and foremen carry on an autocracy of the worst kind under our noses, sometimes for love of it and because they are Huns at heart, but more often because when we look over the returns from the shop we look at the last figures and not at the way they are arrived at.

Concessions of wages to angry and antagonized workmen are only a symptom of mismanagement that has not sought out the truth and acted on it before they discovered it. Democracy knows what they are thinking without asking; it does not wait to be told. It studies and anticipates; it places itself in the workman's place and tries to think as he thinks.

Now is the time for everyone to take stock of himself and his organization and to clean house before public opinion gets on his trail and condemns him to long years of struggle to rehabilitate himself.

Manufacturing The Comptometer

By M. E. Hoag

IV. Dies and Gages

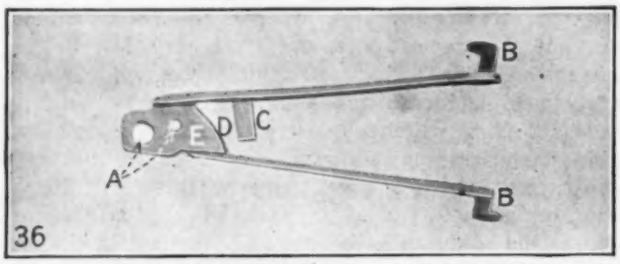
The manufacture in large numbers of small sheet-steel parts demands punch and die work in its highest state of development, and where there are parts having the same general outline but with slight variation in certain points the use of sectional dies accomplishes an appreciable reduction in tool cost. The Felt & Tarrant shops have a considerable number of punches and dies of this construction and the work turned out by them has been found very satisfactory.

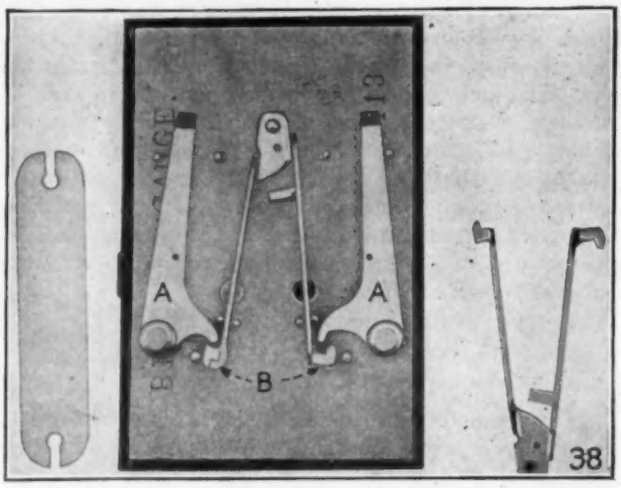
ON ACCOUNT of the great degree of accuracy required in the finished parts of the Comptometer, separate dies and punches cannot be used to advantage, and for that reason the general practice in the Felt & Tarrant shops is to use either pillar or subpress tools as these may be quickly set up and insure absolute alignment at all times.

High-speed production demands more rapid and accurate stock feeds than can be secured by hand, and some very interesting feeding mechanisms have been devised, one of which is shown in Fig. 35. This feed is attached to the bolster plate of the press by the heavy base *A*, which carries the entire feeding mechanism as well as the dies that are being used. This in itself is an advantage over any device in which the several parts are attached to the press, for its members are in fixed relation to each other at all times, and, if occasion demands, the entire equipment may be removed from the press and replaced without disarrangement of the various component parts.

The feed rolls at each end are hardened and accurately ground to size. They are actuated by the pitman rod *B*, which is attached at each end to a lever with hardened pawls, which latter engage the ratchet wheels *C*, which are attached to the lower roll of each pair as illustrated.

The lever at the left of the press is operated through a rod *D*, which is connected to the feed mechanism on the press shaft. This device is identical with the feed movement found on many styles of crank shapers, variation of the feed being obtained by the screw adjust-





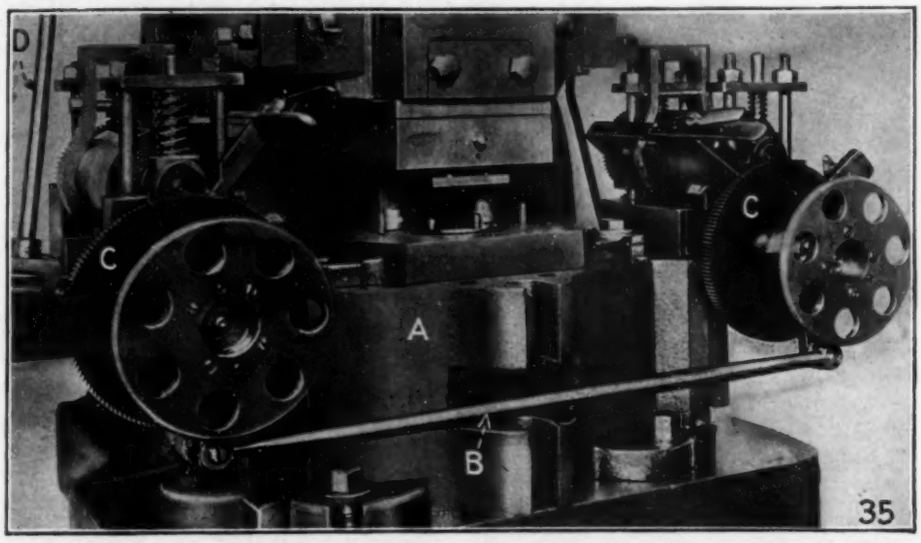
FIGS. 36 AND 38. A DIFFICULT PIECE TO FORM
Fig. 36—Lever of sheet metal. Fig. 38—Gage for lever shown in the illustration Fig. 36

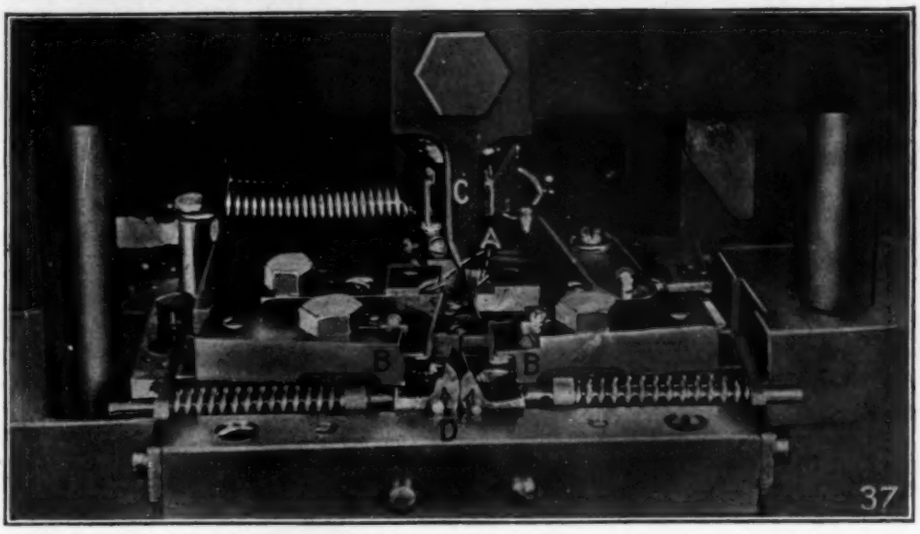
ment of a block in a T-slot, which may be set on center or in position to cause the pawls to engage any desired number of teeth on the ratchets.

The upper rolls are held in contact with the stock

by adjustable compression springs and may be raised or lowered independently by the proper levers to insert or remove stock. These upper rolls are geared at the back of the fixture to the lower set.

Suitable adjustments are provided for raising and lowering the height of the rolls to accommodate die blocks of different thickness, and adjustable guides provide for the location of the stock and for variations in width.





FIGS. 35 AND 37. PRESS TOOLS

Fig. 35—Automatic stock-feeding device. Fig. 37—Bending die for piece shown in Fig. 36

A very interesting compound bending die is used to produce the piece shown in Fig. 36, which is first punched out flat and then bent to form in one operation. The bending die with a finished piece in position is shown in Fig. 37.

The blank is inserted in the form block *A*, and as the punch comes down pins enter the holes *A*, Fig. 36, locating it, while the punch carries it down between the sides of the block. This throws the two ends *B*, Fig. 36, below the edges of the blocks *B*, Fig. 37, and as the punch continues to descend, the wedge *C* passes between the two movable fingers *D*, forcing them back, thus carrying the ends of the piece under the blocks, *B*, giving them the required bend. After bending, the piece is gaged, being located from the two holes. Hardened pins on the gage check the distance between the ends, and also check the angle of the bend. The finger *C*, Fig. 36, is gaged at the same time, and limit plug gages check the space *D* between *C* and *E*. The gage is shown in Fig. 38. The indicators *A* gage the location of the ends *B*. In making frame plates for the Comptometer one general blanking and punching die is used, the blanks so formed being repunched and trimmed to meet various requirements by means of built-up dies so designed that certain sections can be removed and others put in their place, thus making one general die serve for a variety of work. One set of these dies and punches is shown in Fig. 39.

These tools are of the four-pillar type, with heavy holders, which are channeled out to receive the die and punches, as can be seen from the illustration. The die contains nine and the punch 11 pieces. If but few parts were to be made there would be some objection to this style of die on account of the time and work required to change certain members, but as it is the general practice in these shops to make up the parts for a year's estimated production the objection is removed, while the fact that they can be cheaply altered to meet slight changes in design and that it costs little to replace broken parts more than offsets the time required to change the set-up. The entire set of dies measures about 18 in. in length, therefore to properly harden it in one piece without shrinkage and change of form would be a very difficult and expensive process without very special equipment.

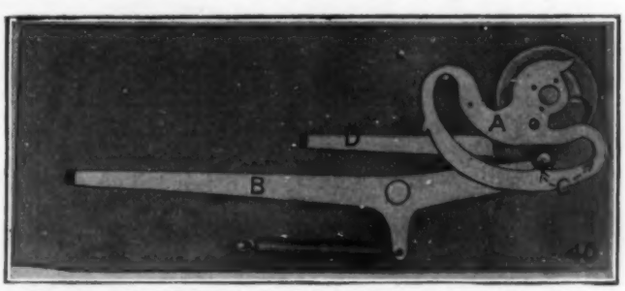


FIG. 40. A SHEET-METAL CAM AND GAGE FOR SAME

As great accuracy is required in the cam shown at *A*, Fig. 40, it cannot be successfully completed with punch and die, but is first blanked out by this method

and then finished in the lathe with the fixture shown in Fig. 41.

The faceplate carries a hardened and ground master form *A*, on which the cam blank is located by hardened pins and fastened down by the screws *B*. A roller which is carried by the block *C* follows the master form and is held in contact by the spring *D*. The turning tool *E* is narrow enough to enter the cam opening and is ground to cut both front and back. It is fed into the work by the cross-slide feed screw *F*, which is provided with a large graduated dial *G* which gages the depth of cut very accurately. The stops *H* limit the size of cam opening.

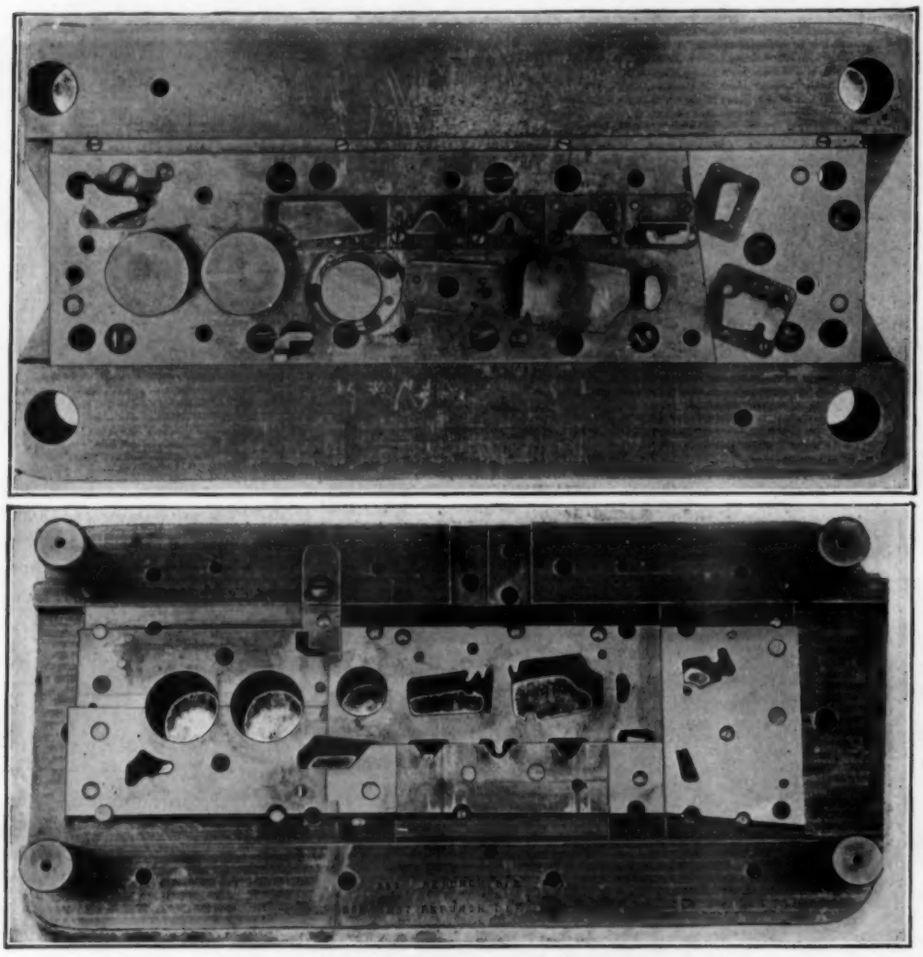


FIG. 39. LARGE BUILT-UP PUNCH AND DIE FOR FRAME PLATES

FIG. 42. A PART OF THE ESCAPEMENT

Two hardened plates *I*, one on the front and one on the back of the faceplate, through the medium of rollers attached to the slide throw the tool into and out of the work as it rotates with the faceplate. The spring *J* maintains contact between these blocks and the rollers.

As each cam is finished it is gaged on the double indicator gage shown in Fig. 40. The indicator *B* gages the portion *C* as shown, and by reversing the cam on the locating pin the indicator *D* gages the other throw in the left of the cam in Fig. 40.

The escapement shown in Fig. 42 and drawing, Fig. 43, is made up of several parts pinned together, as will be described later. The part shown in Fig. 42 is a screw-machine product made from high-carbon steel bars of special cross-section. After coming from the screw machine the faces *A* are finished to very close limits and then hardened and lapped. The milling operation is done on a hand machine by use of the fixture shown in Fig. 44. The work is slipped onto the hardened arbor *A*, and is located from a certain point by a stop in the block at *B*. Two clamping fingers hold the work against the locating stop and clamp it firmly in position by the screws *C*. A yoke (not shown in the illustration) which slips over the two posts *D* and the arbor *A* holds the work firmly in position while the end mill *E* is operating.

After the piece is hardened and tempered, the milled faces are lapped smooth and to exact size with a lapping machine, which is similar in action to a filing machine, an India stone being substituted for the file. The work is held in a jig and fed past the edge of the stone by hand. In assembling the various parts of the escapement they are held in a drill jig which locates them in proper

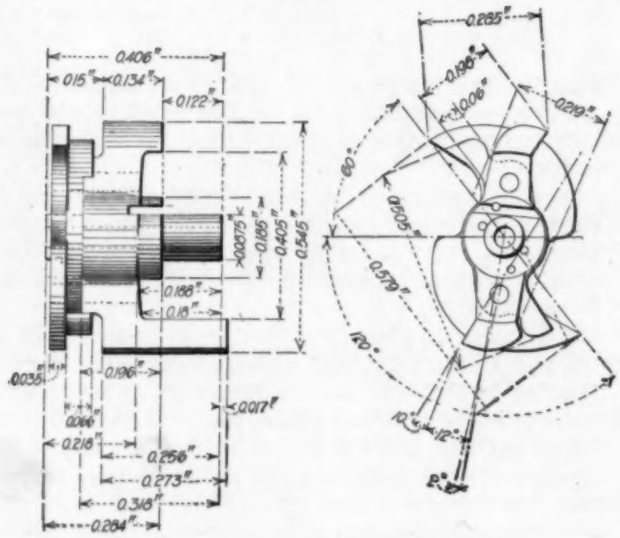
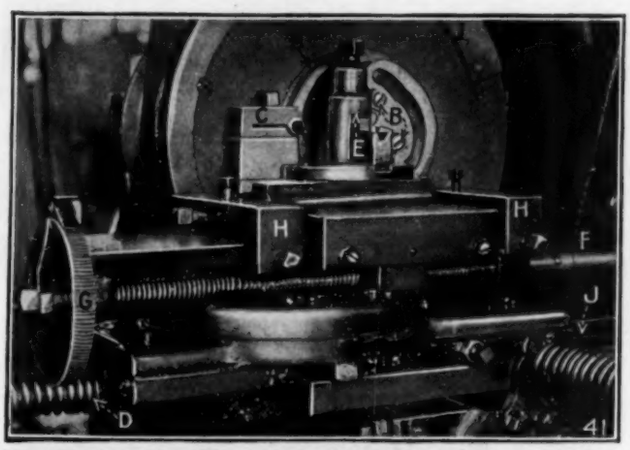
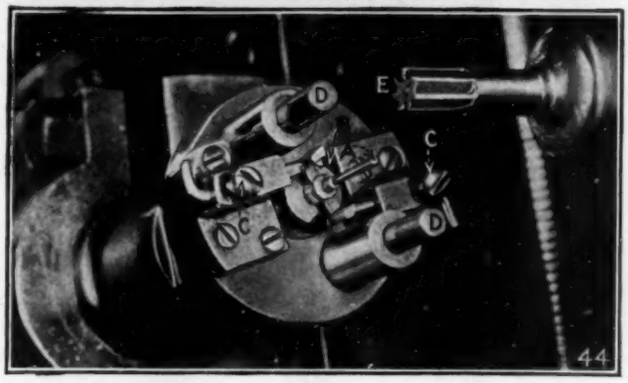


FIG. 43. DETAIL OF ESCAPEMENT

relation to each other, and as soon as they are drilled the drill-bushing plates are removed and pins are inserted in the drilled holes and riveted, thus insuring





FIGS. 41 AND 44. MACHINING METHODS
Fig. 41—Cam-turning fixture. Fig. 44—Milling fixture for escapement part

correct relation of parts which could not be obtained if the pieces were separately drilled before assembling operations were complete.

The Modern Foreman—What Is His Present Job?

BY A. T. SANDY

Following up the interesting article under the above title on page 799, Vol. 48, I believe the fact that the foreman of the old school is passing out of existence is recognized by everyone familiar with large, up-to-date corporations, and yet it is hard for men of 45 or 50 years of age holding positions as general foremen and subforemen to realize that a new condition does exist, and still harder for them to adjust themselves to this new condition.

In the old days if a toolmaker or machinist was given a job to do and did not produce it on schedule he was invariably given a blue slip without any attention being given to using him at some other work or time to allow him to adjust himself to the new conditions and familiarize himself with the tools he had to work with. He was expected, if listed as a toolmaker or machinist, to take a job and do it with very little or no instruction. Students of modern manufacturing conditions know that this is all changed and that the foreman of today must treat his men under a new ruling.

When a foreman gets a new tool from the tool room, a drill for instance, he puts it into the press and starts the machine, finds that the drill does not work properly, takes it out and examines it carefully to find out what the trouble is. If the drill is too soft he might make complaint to the purchasing agent that they are too soft; or it might be that the drill is not ground right, the point might be too blunt or not have enough clearance. Whatever the trouble is, he finds out and remedies it. What would we think of a foreman who would open the window and chuck the drill out without examining the reason for its not working? There is no question but that this foreman would soon be chucked out after the drill. How much more necessary then is it for a foreman to examine with equal or more care the new labor which is offered or brought to him and to find out just where the trouble is and, if possible, to remedy the defects.

NOT ENOUGH MECHANICS

We are in the midst of intensive manufacturing, and there are not enough all-around, thorough mechanics to do the work that has to be done; nor is there any need of all-around, thorough mechanics doing all the work in our manufacturing institutions.

I am well aware that it takes years to develop a good mechanic. I am also aware that any intelligent man can learn to do most of the operations that are being done by mechanics if the foremen in charge will assume the position of a leader, supervisor and helper rather than a boss to goad, criticise and fire.

A large manufacturing plant started employing women in its production department, and in visiting this plant I was impressed with the care the foremen used in instructing these women in the work they were learning. It occurred to me that if the same attention was given to the men learners as was given to the women there would be less need of women in the shops. The fact that women can be taught in a few weeks or months to do as good or better work than men proves that it is because they receive more attention than men.

It is very clear that under the new conditions the necessity for each straw boss, foreman, general foreman and superintendent shall have this one thought above all others—that the human tools which are brought into the factory are entitled to and must have the very best ladership and supervision that it is possible to give.

That labor will respond to kindness and consideration is just as true as that a properly ground drill will do its work. Every mechanic knows that tools properly treated will do their work, and every student of human nature knows that if you get into the life of a man you get the best there is in him. That some men respond more readily than others is true, but it is no reason for the foreman to open the window and chuck the other fellow out any more than there would be reason to throw out of the window some tool which required more attention than another to get it properly adjusted.

The day is at hand when the employment manager will be the big thing in large corporations; the day is here when he hires, rates and assigns men to their respective places, and also transfers them, at least he finds the proper place for the proper man, and if it becomes necessary, as a last resort, to discharge him, the employment manager is the one to do it.

SIDELIGHTS

EDITED BY E. C. PORTER

In order to provide pure drinking water for the men in the trenches and other sections where permanent waterworks have not been established, mobile water trains have been constructed and are now operating in France. These trains are miniature waterworks which chemically treat, filter and sterilize water, making it fit for consumption. They do everything that a municipal waterworks does to insure water to the people of a city.

* * *

There will be placed on sale on or about Aug. 1, according to an announcement by Director General McAdoo of the United States Railroad Administration, a universal mileage scrip at the basic rate of 3c. a mile. Each coupon of the ticket will represent the value of 3c. and can be used for the payment of sleeping and dining car charges and transportation of excess baggage as well as transportation charges on all trains on railroads under Government control. The advantages of this simple form of ticket are obvious, and the change is expected to relieve the pressure on ticket agencies at busy centers. The war tax will be collected by conductors at the time of the presentation of the mileage scrip.

* * *

In a red, white and blue circular recently issued by the Milwaukee Association of Commerce some examples in war-aid work in Wisconsin and Milwaukee are given. The circular states that Milwaukee has oversubscribed its allotment in the three Liberty loans, Red Cross war funds and memberships, and Y. M. C. A., Y. W. C. A. and K. of C. war funds to the amount of $16,597,000. It asserts that Milwaukee has built a gun factory in 60 days; has had no strikes or industrial disturbances, and is producing fabricated-steel ships, millions of shells, grenades and other munition and hundreds of thousands of shoes—all for the army and navy. More than 13,000 Milwaukee boys are enlisted in the military service. On Apr. 15, 1918, there were more Wisconsin men in the trenches than any other state in the union, almost 32,000 boys from the State of Wisconsin having voluntarily enlisted in the United States Army.

* * *

Some valuable statistics have been compiled by the National Automobile Chamber of Commerce in a pamphlet entitled "Wonders of the Automobile Industry." It shows that the industry gives employment to 830,000 persons whose annual wages aggregate $747,000,000. The capital invested, $1,297,000,000, is greater by $250,000,000 than that of all the national banks. The passenger mileage of the 5,000,000 cars in regular use in the United States is not less than 10,000,000,000 more a year than that of the railroads. The seating capacity of automobiles is 25,000,000 persons compared with 3,500,000 for the railroad cars. If the railroads would undertake to handle the number of persons carried by automobiles it would require duplication of all their passenger locomotives and cars at a cost of more than $1,000,000,000 as well as duplication of their passenger tracks, stations and employees. It is shown that farm values during the 16 years after the introduction of the automobile increased at three times the rate of the previous 20 years.

* * *

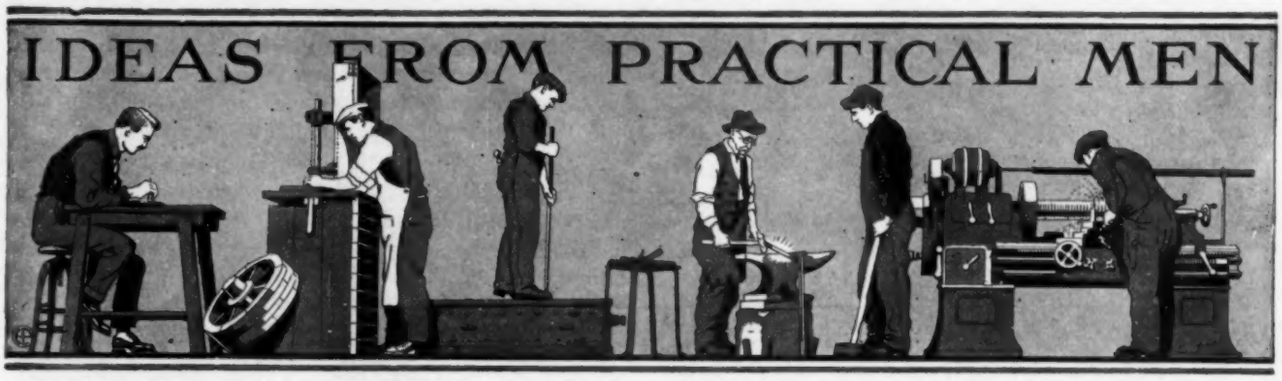
Joseph Meadon, a prominent Detroit business man recently made a census of the large plants of Detroit in regard to the employment of female labor. Mr. Meadon was able to get confidential information from high officials of the various plants. The result of his investigations proved highly gratifying to even the most optimistic advocate of female labor. The plants included in the census employed a total of 113,699; the largest plant employed 37,000 and the smallest 150. Of the entire number of plants a very small number, employing only 9900 men, declared they could not use female labor. Firms employing 103,799 men replied that they could use female labor. The extent to which they could be introduced varied from 3 to 33⅓ per cent., with an average of 19 per cent.

* * *

In order to impress strongly upon the minds of workers the importance and need of constantly exerting greater effort to increase production, especially of war essentials, the Department of Labor has prepared a series of bulletins designed to increase production. Everyone, whether employer or wage earner, is urged to work full time all the time. It is also sought by these bulletins to discourage shifting from one job to another, as well as to advise all those engaged in production to guard against German intrigue and cunning, which is at all times alive to the spreading of vicious and dangerous untruths. These bulletins are furnished free of cost to manufacturers and others who wish to post them for the inspection of their employees. Sample copies may be obtained by writing Roger W. Babson, Chief of Inquiry and Education Division, United States Employment Service, 16th and I Sts. N.W., Washington, D. C.

* * *

Based on the mortality statistics of the Allied armies the individual soldier has plenty of chances of coming out of the war unscathed, or at least not seriously injured, regardless of the great danger and large losses in the aggregate. He has 29 chances of coming home to one change of being killed; 49 chances of recovering from wounds to one chance of dying from them, and one chance in 500 of losing a limb. In some of the past wars from 10 to 15 men died from disease to one from bullets, but in this war the soldier is freer from disease in the army than in civil life, has better medical care at the front than at home, and will live five years longer because of the physical training he receives. For those of our fighting men who do not escape scathless the Government under the soldier and sailor insurance law protects the wounded and their dependents and the families and dependents of those who are killed.

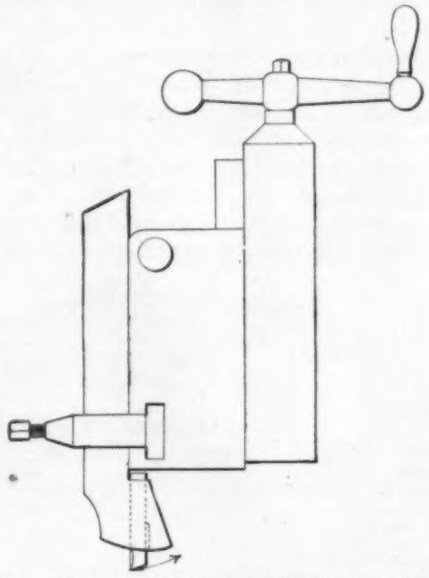


Reversing the Toolholder to Insure Smooth Cutting

BY THOMAS FISH

President Ready Tool Co.

In the *American Machinist*, page 641, Vol. 48, there is an article by G. Grolluman in which he shows a toolholder reversed to eliminate chatter. The Ready Tool Co. has been advertising a shaping and planing



SHAPING AND PLANING MACHINE TOOL

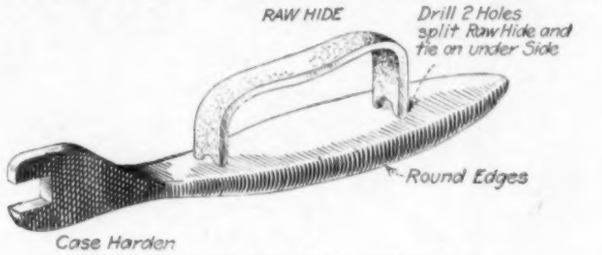
tool so much that it is strange he did not know there was a tool made in which "the cutter is back of the line of deflection." It gives the operator just what Mr. Grolluman speaks of, and is made for shaping and planing machines. The illustration tells the story.

"Husking Peg" Wrench for Grinder Operators

BY JOHNNY HOOVER

Small devices that may appear insignificant sometimes stimulate production to quite a degree, and we should make use of them whenever possible. In grinding small work between centers the setscrew of the grinder dog must be manipulated frequently. Suppose we wish to rough and finish grind 2500 pieces say ⅜ in. diameter by 4 in. long; we must use the dog twice at each end, and the operator is obliged to reach for the wrench 10,000 times and the same number of moves are required to put it back in its proper place, making a total of 20,000 movements.

With the wrench shown in the reproduction the operator slips two fingers through the loop and it is always



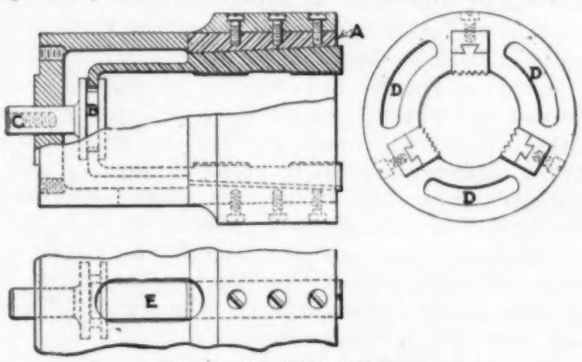
THE "HUSKING PEG" WRENCH

"on hand" without being too much of a hindrance in handling the micrometers. It has been called the "husking peg" wrench, and everyone from the farm will appreciate the term.

Air-Operated Chuck for 6-In. High-Explosive Shells

BY G. GARRETT

The illustration shows a three-jaw air-operated chuck designed by the writer for use on 6-in. high-explosive shells. The body is of cast iron finished all over and made to fit the nose of the lathe spindle, the outer end being supported in a steadyrest. It is shaped out to receive the hardened-steel jaw slides *A* which are held in place by the countersunk head screws, as shown, and



AIR-OPERATED CHUCK

are provided on their inner surfaces with a dovetailed slot to receive the jaws.

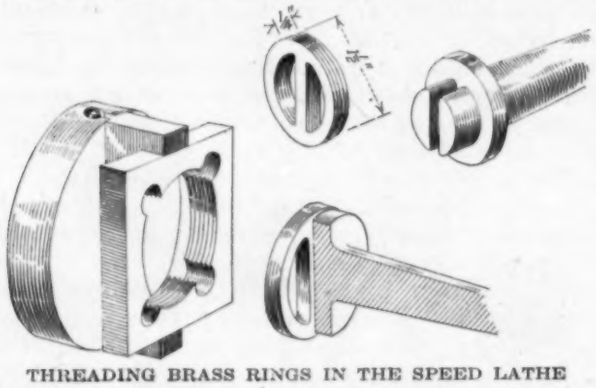
The jaws are fitted to these slides and the rear ends are fitted to the operating ring *B* which is attached to the air cylinder by means of the rod *C*. They are

then bored out in place before serrating and hardening. The body casting is cored out at *D* to reduce its weight and at *E* to provide clearance for the tool in fitting the jaw slides.

Quick Method of Threading Small Cast-Brass Rings

BY J. LIMBRUNNER

Having several thousand small cast-brass rings upon which to cut external threads the writer proceeded to do the work in the manner shown in the illustration. The ring had a division through the center, which



THREADING BRASS RINGS IN THE SPEED LATHE

furnished a ready means of holding. A threading die was made from a square piece of steel and held in the chuck of the speed lathe while the rings were fed up to and through the die by the hand-operated tail spindle.

The operation was continuous, the rings being fed clear through the die and dropped out of the opening between the chuck jaws. To prevent the rings from being thrown by the chuck a guard of wood was built over it, and far enough away to prevent jamming an opening is left at the bottom for the rings to roll out.

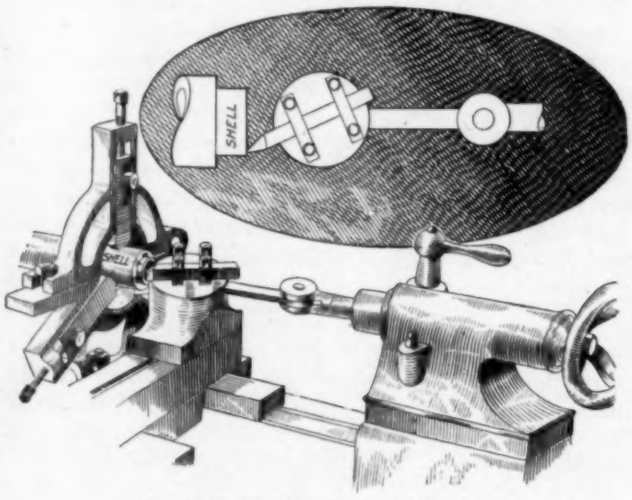
Using an Old Engine Lathe to Boost Shell Production

BY H. ALTON WILSON

In the base of British high-explosive shells a "gas-check" plug is inserted to prevent the hot gases generated in firing from entering the projectile through possible pinholes, pipes or flaws that might be present in the base of the forging and thus cause a premature explosion that would be disastrous to both gun and crew. In the 4.5 shell a riveted baseplate, as the gas-check plug is commonly called, is generally used, although a threaded plate may be also used. The riveted plate calls for a circular recess in the base 3⅜ in. in diameter by ½ in. deep. Manufacturing specifications call for the bottom of the recess to be absolutely flat. That requirement means a special finishing operation if maximum production is to be attained.

The finishing operation is easily taken care of, but the real problem is to get a machine that will stand up to the process of roughing out this metal and at the same time maintain an output that is satisfactory. The writer tried several special-purpose lathes that were on the market in 1915, but none were equal to the task. In desperation an engine lathe, at least 25 years old, which had been purchased from a local marine repair shop, was put on the job to increase production in this operation. A collet chuck and steadyrest were fitted to the lathe and an old four-stud European toolpost was placed on the cross-slide. A piece of high-speed steel 1½ x ¾ in. was cut on an angle so as to give a cutting edge of approximately 1 1/16 in. The toolpost was placed to allow this cutting edge to be at right angles to the longitudinal axis of the lathe, and the tool adjusted by moving the cross-slide to that point where the tool would cut the recess approximately 1/32 in. smaller than the finished size and at the same time leave no nib in the center; the cross-slide was then locked in position. The feed was arranged through the medium of the tailstock. The lathe was fitted with a positive stop for the carriage and the tool set to cut the proper depth of recess. The tail center was removed and a fixture consisting of a jointed bar, as shown in the sketch, was inserted. The tool is moved up to the work by the handwheel on the apron and then forced into the work by means of the tail spindle. A special screw and nut was put into the tailstock to permit of this rough and constant use and a large handwheel provided. To place a shell in the chuck the carriage is moved toward the tailstock by the handwheel in the apron. The chuck is closed on the shell and the carriage moved up to bring the tool to the work. The jointed bar is then swung around and placed against the toolpost, and the tool forced into the work until the stop is reached. To remove the shell give the tail-spindle wheel a spin backward; break the joint in the bar; run the carriage back; release the chuck, and pull out the shell.

Everything is simple and inexpensive to build. There



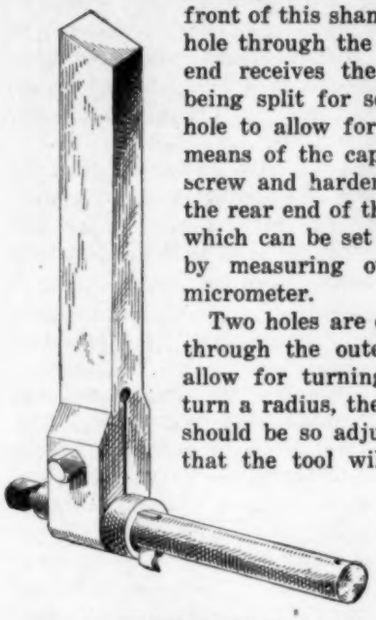
CUTTING RECESS IN SHELL BASE

are no perishable parts or weak spots, and these home-made fixtures rough out more bases than any special machine the writer has seen. The sustained production based on a record of many months is 20 an hour. The old lathe has been on this job for over two years. The back gears are used and the spindle speed is 80 r.p.m. The lathe is 26 in. swing and is driven by a 3½-in. belt. Only one serious accident has occurred—the small pinion on the cone driving the big back gear stripped and broke several teeth in the large gear. These gears were of gray iron. A steel pinion and large brass gear were made and have been satisfactory.

Radius Planing Tool

By F. E. Ervin

The internal planing tool shown on page 880, Vol. 48, of the *American Machinist* is similar to a tool I have used for planing small radii. No clapper box is needed, as the cutter is placed just in front of this shank and thrust collar. A hole through the shank near the lower end receives the tool bar, the shank being split for some distance past the hole to allow for clamping the bar by means of the capscrew shown. A setscrew and hardened rod inserted from the rear end of the bar clamps the tool, which can be set to any desired radius by measuring over the bar with a micrometer.



TOOL FOR PLANING RADII

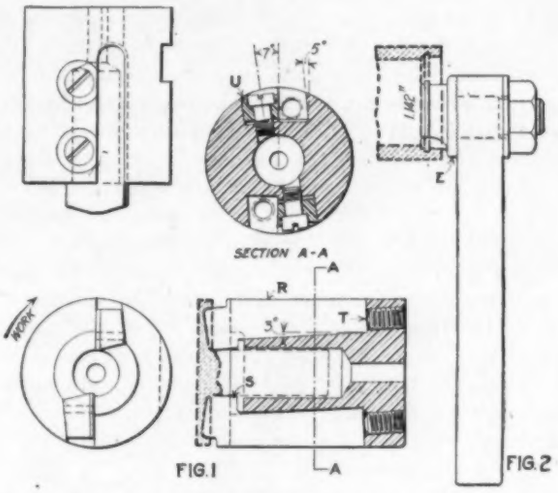
Two holes are drilled at right angles through the outer end of the bar to allow for turning it with a pin. To turn a radius, the tension upon the bar should be so adjusted by the capscrew that the tool will not move of itself under pressure of the cut, but not tight enough to prevent it from being turned by means of the pin. Very accurate and perfect work can be done with this tool, and there will be none of the chatter and trouble that usually accompanies the use of formed cutters for the purpose.

Special Machine Tools for Airplane Motor Work

By Clifford Dengler

We have designed and have in service three tools used in building the Hispaño-Suiza airplane motor, which may be of interest to those engaged in other lines of machine work. The illustrations are practically self-explanatory. In Fig. 1 is a hollow form mill for semi-rough turning of a valve tappet and forming under side of head. The tool is of high-speed steel, inserted adjustable blades, and is used on the Warner & Swasey turret lathe. The two blades are set on an arbor at an angle of 3 deg., so that they can be pushed forward and reground to correct size. Blade *R* controls correct stem diameter and blade *S* maintains the correct form. The blades are advanced by screw *T*, and held securely by two gibs *U* with a flat on one side slightly more than the angle on blade.

The forming tool in Fig. 2 is used on the camshaft. This operation caused considerable trouble until this tool was made, which is only an inside forming tool of high-speed steel fitted to a holder that goes on the toolpost of the lathe. The cutting edge is at *E*, relieved as shown for chip space, and may be turned at the knurled joint and reground as it wears.



FIGS. 1 AND 2. A HOLLOW MILL AND A FORMING TOOL

Fig. 3 represents one of the successful ways we employ for making reamers and boring tools with inserted tool-steel or high-speed steel blades. The blades are milled in on a small angle so they can be advanced and reground, and they are held securely with straight pins with a tapered flat; this method holds the pins very firm all along the flatted area. The rest of the drawing shows a special case where a large cast-iron body bushing is adjustable for depth of cut by means of locknuts and washer *M* and *N*. The boring bar itself is milled and grooved, as shown, and fits a Magic chuck, which is used in large numbers throughout our shop, as we find they work very successfully. The blades are relieved upon the corners for the purpose of enabling them the better to stand up to their work and reduce the frequency with which they require grinding.

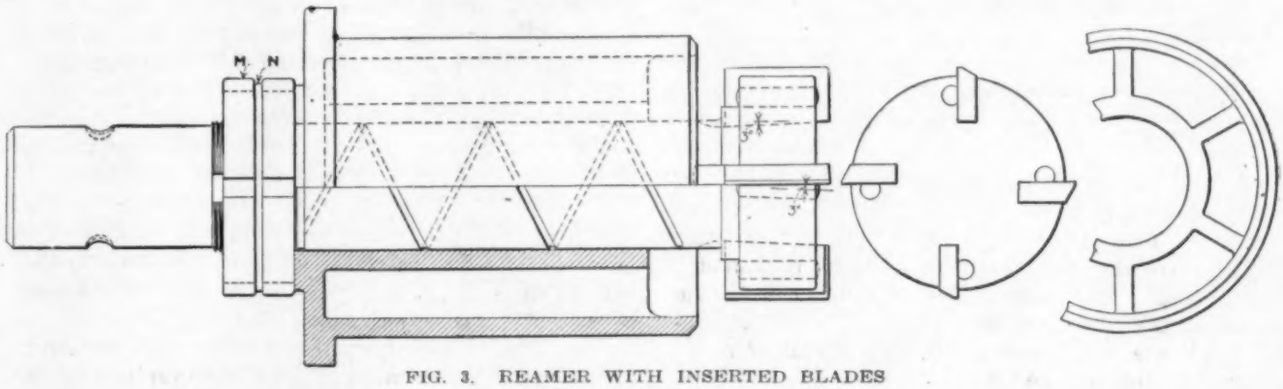


FIG. 3. REAMER WITH INSERTED BLADES

EDITORIALS

The Need of Production Engineers

THE editorial entitled "The Duty of the Engineer," which appeared on page 1117, Vol. No. 48, has brought out several extremely interesting letters from engineers who have not gone into the service and who tell why in no uncertain terms. The main obstacle seems to be the difficulty of finding the place where, in the opinion of the engineer, he can be of the most service.

It cannot be denied that there are often serious obstacles in the way of even the most competent engineer becoming connected with some of the various activities connected with the war. This is particularly true where the position in question comes under the civil-service rules, as in many cases these would effectually prevent the hiring of the most competent engineer because of the lack of one or two utterly nonessential qualifications. This condition, however, must not be attributed to the existence of the civil service, but to the way in which it has been administered in the past.

* * *

In other cases the inclusion of the "anti-stop-watch" provision in the army and navy appropriation bill has convinced high-grade production engineers that efficiency was not wanted, and confirms them in a belief that everything connected with the Government must of necessity be inefficient.

Instances of extremely low production which could only be due to deliberate slacking are occasionally cited, and these instances include about every operation from shipbuilding to bricklaying. In all these complaints, however, there seems to be an entire overlooking of the fact that they are nearly always isolated cases and do not reflect the general condition even though it be admitted that this is not all that could be desired. If these were not isolated and exceptional cases we should not be producing anywhere near the amount of material which is completed every day along these many lines of activity.

Instances are cited where the men, aided and abetted by the foreman, deliberately instruct a newcomer to hold back on his work and to call him down in no gentle language in case he fails to do so. When such things as this occur, and there is no doubt that they have occurred in numerous cases, it is evidently the duty of anyone knowing such facts to communicate them at once to the Secret Service Bureau of his district. There is no need to consider ancestry in the least, for, no matter where a man may have been born or what his parentage, if he intentionally holds back on his work and endeavors to induce others to do the same he is pro-German to all intents and purposes and should be dealt with accordingly.

It is very unfortunate that it has been impossible to provide machinery whereby every available engineer could be used and at once placed in his proper position. It is equally to be regretted that all men who have special talent along production lines should not have been utilized. It is, however, too much to expect that any organization can be expanded to the extent the War Department has been without many mistakes being made and many incompetent men being placed in responsible positions. We were not organized for war and it takes time to perfect any organization.

But in spite of all this we must remember that the country needs the services of every engineer of ability, and if he wishes to do his full duty he must try his best to find a place where he can be of service and not wait to be coaxed into some special position.

Keeping Our Boys Supplied

THE news from France is most encouraging not only in the actual gains which have been made but in the assurance that General Foch feels strong enough to strike back and the fact that our boys have been tried by fire and have stood the test—just as we knew they would.

It is also encouraging to know that in a year from the first draft we had landed over a million men safely in France, and over a quarter of a million of them were sufficiently trained to defeat the veterans of the German army. We can well be proud of playing even this comparatively small part in such a drive with only twelve months of preparation without overlooking the important part taken by the splendid soldiers of our allies.

Our boys in France are proving their worth, and they will continue to prove it as long as they are supplied with all the munition they can use. But, using them up by millions as they do, this is no easy task, and it behooves us all to ask ourselves once more if we are doing our part.

* * *

Did you read of our boys who had been under fire and advancing for twenty-four hours resisting a counter attack and defeating it? Did it make you think that perhaps we might refrain from taking an afternoon off for baseball or golf and stick to the job a little more closely? Did it make us want to turn out a little more product each day and help swell the number of guns, or shells, or airplanes, or other munitions?

We know of course that no troops can stand twenty-four-hour shifts as a regular thing, and we know that Great Britain has proved, if proof were necessary, that long hours in the shop do not pay except in some great emergencies.

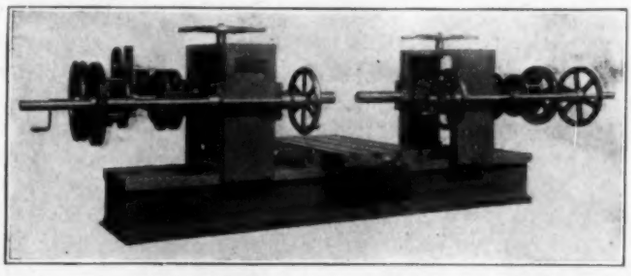
But lost time is another matter. The hours we lose, the time a lathe or other machine is idle, can never be made up. The shells it might have made can never be fired at the enemy, and this lack may have a direct effect on the outcome of a battle.

We are proud of our boys in France—as we knew we should be. Let us make them equally proud of us by sticking to our jobs through thick and thin and supplying everything they need.

This department is open to all new equipment of interest to shop owners. Photographs and data should be addressed to Editorial Department, "American Machinist"

Pedrick Duplex Boring Machine

The illustration shows a duplex, horizontal boring machine that is being manufactured in two sizes by the Pedrick Tool & Machine Co., 3640 North Lawrence St., Philadelphia, Penn. The machine consists of two housings mounted on a bed, each housing containing an independent boring bar with driving and feeding mechanisms complete, two motors being consequently required for the drive, these, of course, being replaced by belt drive if this form is desired. The housings are movable along the bed to suit the work in hand, and the bars are raised and lowered by means of the handwheels shown above the housings. Three changes of feed are provided—automatic and reversible. A quick-return motion is provided. The feed motion is controlled either from the end of the machine or, if desired, may be brought to the working position from where it is controlled by means of handwheels. The motors recommended for driving the machine are 2-hp. variable speed for 3-in. bars, and 3-hp. variable speed for 6-in. bars, the speed range being from 350 to 1350 r.p.m. The boring bars have taper holes in the ends, and if desired a facing attachment can be furnished as an extra.

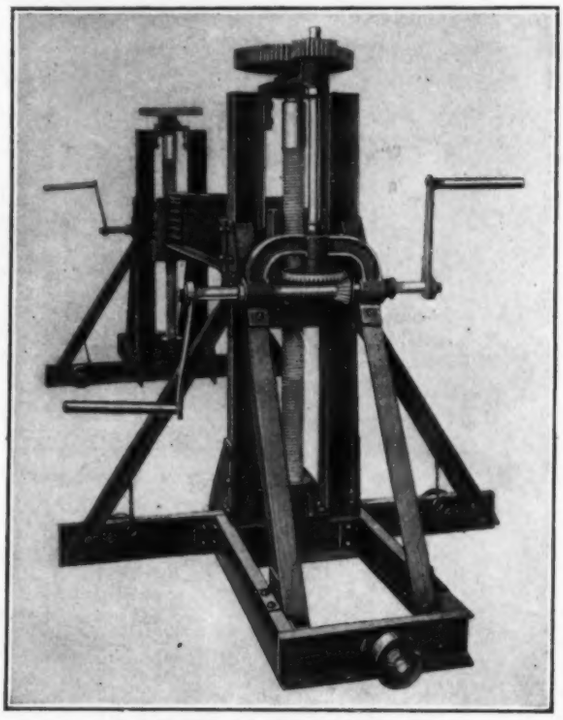


PEDRICK HORIZONTAL BORING MACHINE

Made in two sizes with specifications as follows: Diameter of bars, 3 or 6 in.; length of bars, 4 ft. 6 in. or 6 ft. 8 in.; minimum distance from center of bars to bed, 6 in. or 9 in.; maximum distance from center of bars to bed, 23 or 28 in.; travel of bars, 16 or 21 in.; maximum distance between bars, 63 or 47 in.; taper of holes in boring bars, Morse No. 5 or 6; size of bed, 21 in. wide, 18 in. high, 9 ft. 6 in. long; size of cross-table, 24 in. wide, 4½ in. high, 48 in. long; travel of cross-table, 30 in.

Fox Portable Shop Crane

The portable shop crane illustrated is one of the recent products of Fox Bros. & Co., 126-130 Lafayette St., New York City. A complete set consists of four separate jacks with two cross-girders, each jack being operated by a pair of handles so arranged that either two or four men can operate one jack at a time. In cases of light loads the handles are so balanced that one man can operate a jack. Each jack is mounted on cast-iron wheels with flat treads so that they can be easily moved from place to place. The wheels revolve on shafts which are held on eccentric bearings, and by means of these eccentric bearings the wheels may be raised and the entire base of the jack rested on the shop floor while carrying the load. The framework is constructed entirely of structural-steel shapes riveted together. The main screw is of hammered steel and the cast-iron nut, or raising block, is threaded to fit. The power is transmitted to these from the handles by means of miter and spur gears, which give the necessary mechanical advantage. All gears are of cast iron and the bearings are bronze.

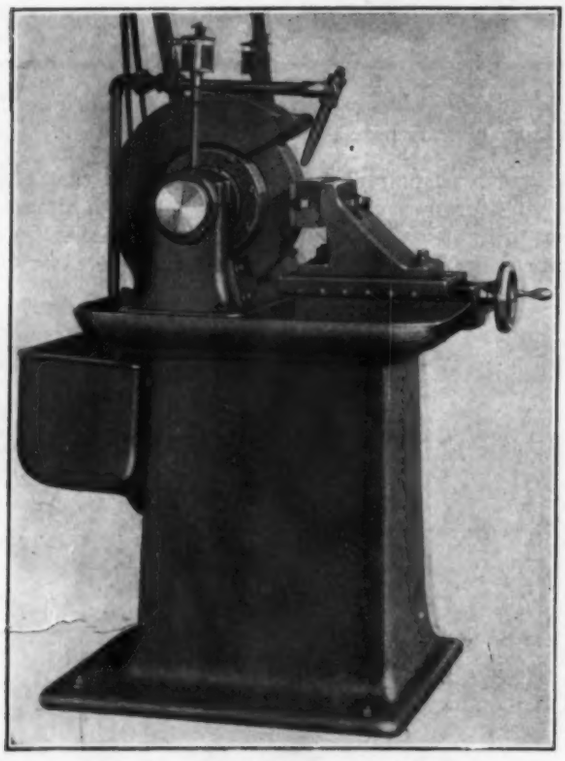


FOX PORTABLE SHOP CRANE

Working capacity, 60 tons; minimum distance of cross-girder from floor, 2 ft. 8 in.; maximum distance of cross-girder from floor, 6 ft. 3 in.; extreme width of base, 6 ft.; extreme depth of base, 5 ft. 6 in.; extreme height at top of spur gear, 7 ft.; net weight 8000 lb.

Detroit Roll Grinding Machine

The Detroit Tool Co., 1487 St. Antoine St., Detroit, Mich., is now marketing the roll grinding machine shown in the illustration. This machine will grind cylindrical pieces from ¾ to 1 in. in diameter that are straight and have no larger portions than the part to be ground. Smaller and larger sizes can be accommodated, but are rather the exception to the demand for this type of work. The piece is ground by placing it in a guide block or die block along which it is slid

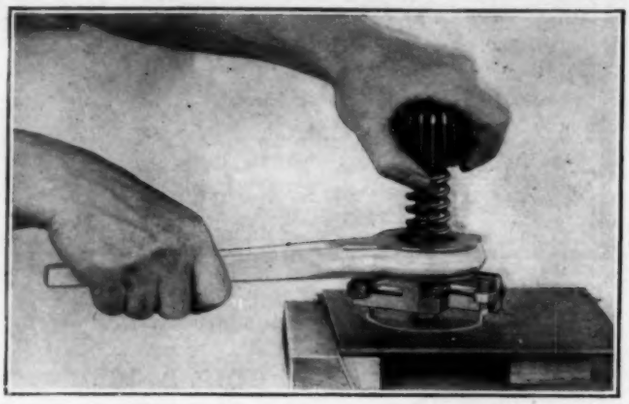


DETROIT ROLL GRINDING MACHINE

until it comes in contact with the grinding wheel, at which time it starts to rotate. The wheel is trued slightly conical, and the moment the work touches it the former starts to rotate although at a comparatively slow speed. Cuts range from two to three thousandths of an inch, but the pieces when finished are claimed to be of very uniform size. The great advantage of the machine is that work may be handled which does not have centers.

Koch & Sandidge "Jiffy" Adjustable Steel-Plate Cutter

The Koch & Sandidge Co., Chicago, Ill., is now marketing the "Jiffy" adjustable cutter, which is designed to cut holes from 1¼ to 6 in. in diameter in metal plate. The standard knives furnished will cut through plate $\frac{3}{16}$ in. thick, but special knives can be supplied for cutting plate up to ½ in. thick. Special knives can also be furnished to cut holes in materials such as slate, marble, fiber, etc., up to 1 in. thick. As may be noticed the tool consists of a swing chuck with two knives adjustable to various center distances, the pressure on these knives being obtained by means of a heavy spring, the tension on which is controlled by an adjustable hand nut at the top. The tool is fastened in place by means of a nut on the under side, which is screwed in place after a ¼-in. pilot hole has been drilled through the material. Where thin material is being cut, a flange is generally



ADJUSTABLE CUTTER FOR STEEL PLATE

used in addition to the nut. In case it is impossible to get to the rear side of the plate to screw on the nut, the pilot hole can be tapped and the bolt screwed directly into it. Another use of this device is to make washers of unusual size.

Robertson "Economy" Tire Saw and Shell-Sawing Fixture

Fig. 1 shows the No. 600 "Economy" tire saw being manufactured by the W. Robertson Machine and Foundry Co., Buffalo, N. Y. This machine is for cutting off the steel rim which supports the rubber on truck tires

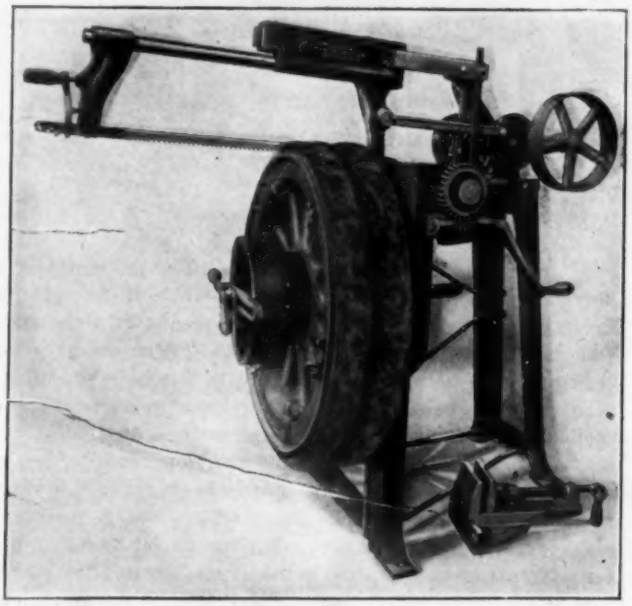


FIG. 1. ROBERTSON "ECONOMY" TIRE SAW NO. 600
Length of blades used, 12 to 24 in.; capacity in frame, 8 x 17 in.; capacity of wheel, 17 x 40 in.; net weight, 590 lb.; floor space, 36 x 66 in.; height to blade when cut is complete, 40¼ in.; height over all, 55 in.; shipping weight crated, 675 lb.

after they are so worn as to be of no further use. These tires when new are pressed on the wheel rim with hydraulic pressure, but after being in service it is impossible to start them from the rim by this method, so ordinarily they are sawed from the wheel. Worm

gearing is employed to raise the wheel to the proper height, and the machine is provided with a gage to stop the cutting when the saw is through the tire rim. The machine cuts on the draw stroke and the frame is lifted on the return stroke by an oil compression lift pump. The frame is adjustable, allowing the use of blades from 12 to 24 in. in length which will cut rims on dual tires 16 in. wide or under. The drive may be either belt- or direct-connected motor as desired.

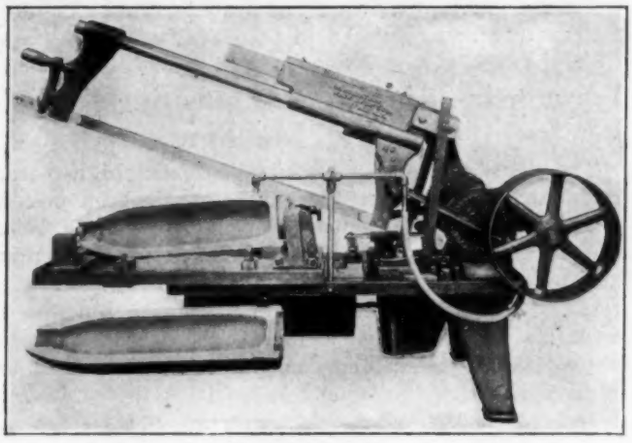


FIG. 2. FIXTURE FOR NO. 6 "ECONOMY" SAW FOR CUTTING 6-IN. SHELLS LENGTHWISE

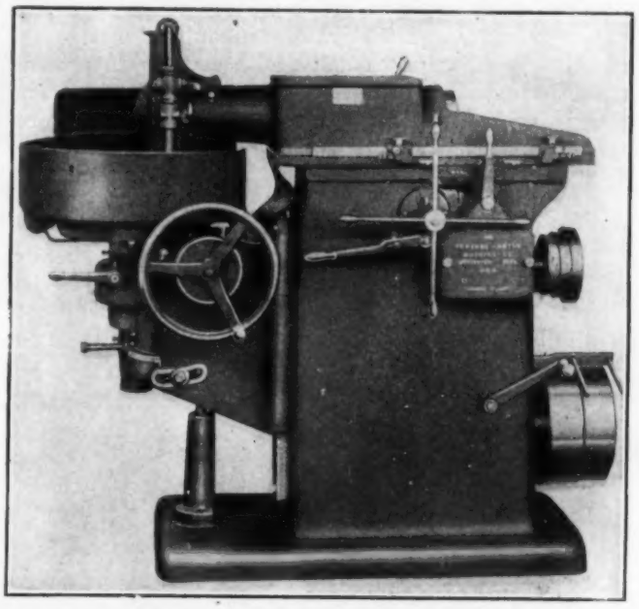
The machine is furnished with a 6-in. vise for cutting work on stock of the ordinary type.

Fig. 2 shows a fixture that is being made by this company for use on its No. 6 "Economy" saw. The fixture is for cutting 6-in. shells lengthwise through the center, an operation which is performed on a certain number of shells during the inspection operation. The fixture consists of a holder with taper jaws entering the flange of the shell on the large end and with clamps on the small end, the idea being to open the shell rather than close it while the cut is being made. The shell is elevated at the rear during the cutting, which allows the blade to be working in thin sections at all times, thereby relieving the teeth from choking.

Persons-Arter 16-In. Rotary Surface-Grinding Machine

The rotary surface-grinding machine shown in the illustration is the latest product of the Persons-Arter Co., Worcester, Mass. This is an addition to the line of rotary grinding machines that are already manufactured by this company in 8- and 12-in. sizes. The machine is equipped with a magnetic chuck 16 in. in diameter, but it will take work up to 17½ in. in diameter and can swing work 21 in. in diameter with wet-grinding equipment and 24 in. in diameter with dry-grinding equipment. The machine will grind rectangular work up to 8 x 16 in. in size. The vertical capacity of the machine with a grinding wheel of full diameter is 10 in., while work of greater thickness can be ground with a smaller wheel. The wheel head slides on one V-way and one flat way and its travel is controlled by a hand feed or by dogs mounted on the rack if automatic control is desired. The dogs can be set for any length of stroke from ½ in. up to the maximum, and minute adjustment is secured by means of screw-controlled pawls. The wheel spindle is $2\frac{3}{16}$ in. in diameter and is made of chrome-nickel, heat-treated steel and runs in bronze bearings of the straight split type tapered on the outside for adjustment. The belt position is forward on the slide, which is claimed to offset the tendency of the wheel to lift when traversing the work.

The slide is automatically controlled by a patented single-tension spring-reversing mechanism. On the shaft, on which the three-step cone pulley seen is mounted, are two small bevel-pinion clutch gears which are constantly in mesh with a large bevel gear. This bevel gear is mounted on a shaft which drives the slide through a pinion gear, a vertical shaft and a rack. These pinion clutch gears run free on the shaft until a double-faced clutch, slidably keyed on the shaft, engages the clutch teeth on the inner face of either pinion gear according to the direction in which the slide is to travel. The clutch is shifted by a lever which is actuated by adjustable dogs on the wheel slide rack. To the lever are attached two lugs connected by a tension spring of sufficient strength to shift the clutch into mesh with either pinion gear.



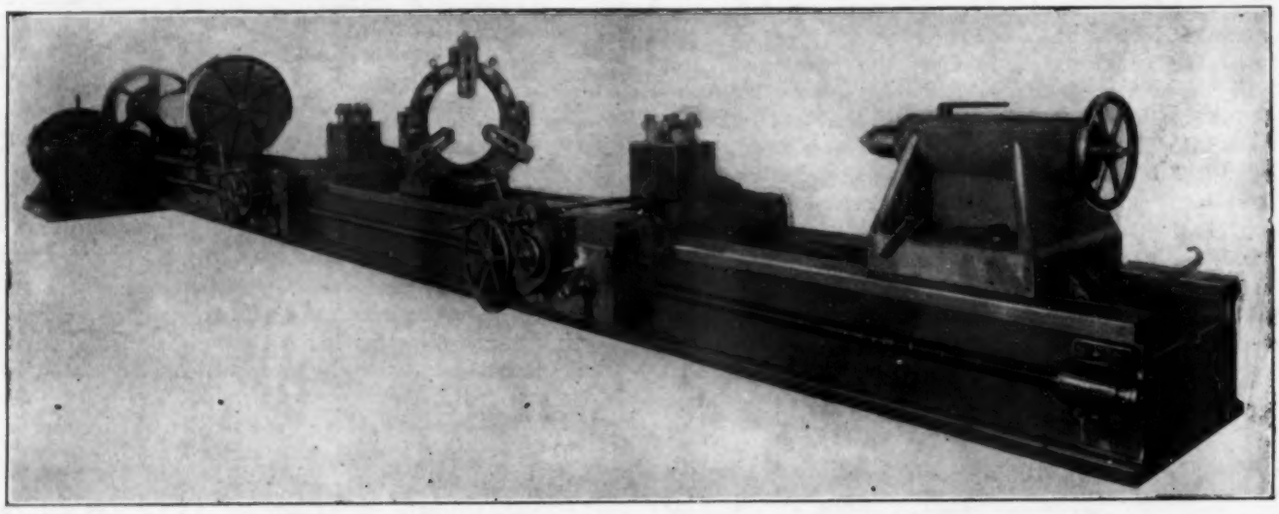
PERSONS-ARTER ROTARY SURFACE-GRINDING MACHINE

The work table is raised or lowered by means of a handwheel to which is attached an indicator disk graduated to half thousandths of an inch. A tapered adjusting gib runs the full length of the slide and is controlled by means of a screw at the top. The work-table spindle has a hardened-steel collar with a tapered face shrunk on its upper end, the angular face of this collar, 65 deg. from the horizontal, running in a bronze bearing. Lubrication is by means of a spiral groove on the face of the collar which carries oil from the reservoir below the bearing up to the top of the collar, whence it flows back to the reservoir through holes drilled in the collar. The lower bearing is made of cast iron, its function being merely to steady the spindle. The spindle is driven by means of a bronze spiral gear mounted on the end of a universal shaft, this gear being constantly in mesh with a cast-iron gear normally running free on the spindle but locked by means of a friction clutch when in operation. The entire chuck-spindle

bracket is pivoted on a taper pin so that it can be tilted for grinding beveled or dished surfaces up to 16½ deg. from the horizontal. The bracket is adjusted by means of a screw. All wiring is contained in the water pan, and the magnetizing of the chuck is performed by a double-pole switch which has a quick-action demagnetizing feature. The wiring is protected by means of a fuse which is placed on the same base as the plug socket, and brushes are so arranged that they can be readily examined from beneath the water pan and may be removed without disturbing any other part of the machine. The bottom of the water pan slopes in both directions to carry the water down quickly to one corner where the outlet is located. The approach to the outlet is cored away so as to break up any tendency of the water to eddy, and the water tank placed beside the machine is of large capacity. Except for this water tank the machine is self-contained in every way and may be belted from the line shafting. A pump is provided for circulating the water.

Elyria Turning Lathe

The illustration shows a 42 in. by 40 ft. plain, heavy-duty turning lathe that is being manufactured by the Elyria Machine Co., Elyria, Ohio. This machine is said to be of very massive construction and suitable for turning guns, propeller shafts and heavy forging work. It can also be furnished with short bed length for use on large projectiles. The machine is driven by a variable-speed motor and the spindle bearings are of babbitt.



ELYRIA 42 IN. BY 40 FT. PLAIN, HEAVY-DUTY TURNING LATHE

Capacity between centers with 30-ft. bed, 20 ft.; swing over shears, 42 in.; swing over carriage, 30 in.; capacity of steady-rest, 24 in.; motor, variable-speed, 32 hp., 300 to 1200 r.p.m.; ratio of motor to spindle, 70 to 1; spindle speeds, 4 to 17 r.p.m.; front spindle bearing, 12 to 16 in.; rear spindle bearing, 8 to 12 in.; diameter of hole through spindle, 2⅞ in.; taper center in spindle, Morse No. 7; diameter of tailstock spindle, 6 in.; travel of tailstock spindle, 18 in.; size of tool, 1¼ x 2½ in.; shipping weight, with 30 ft. bed, 49,000 lb.; weight per 2 ft. of bed, 1000 lb.

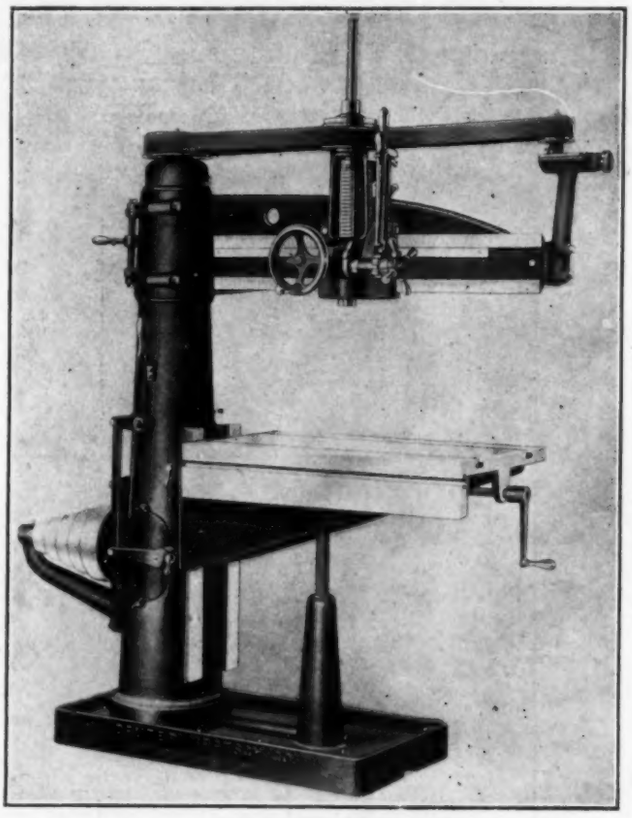
Coats Anti-Scale Compound for High-Speed-Steel Hardening

The Coats Machinery Co., Land Title Building, Philadelphia, Penn., is now marketing a material known as Coats anti-scale compound for the protection of high-speed-steel tools during the hardening process. The material is claimed to have no other action on the steel than to shut out the oxygen and acid gases of the furnace, thus providing a method of turning out hardened high-speed-steel tools of good appearance with sharp cutting edges and free from surface defects, such as scale, pits, etc. The compound is a thick cream-colored paste which clings to the surface of the metal during the heating, but is removed by the quenching bath. The tool to be hardened is heated to a dull-red heat and then plunged into the paste and stirred vigorously, after which the tool is withdrawn and heated to its hardening temperature and quenched in the usual manner.

Wisconsin High-Speed Sensitive Radial Drilling Machine

The illustration shows the Wisconsin high-speed, radial drilling machine that has recently been placed on the market by the Dauber-Kratsch Co., Oshkosh, Wis. The illustration shows the machine with a tapping attachment. The hollow column is bolted to the base casting and carries the table on its lower end and a swinging arm on the upper end. The table is carried on wide Vs on the column and has two locking handles for securing it in position. In addition the screw for raising or lowering acts as a support. This screw is operated by means of the crank handle shown at the front of the machine, motion being transferred through a pair of bevel gears, the load being carried on a ball thrust bearing in order to insure ease of operation. The swinging arm is of hollow section and ribbed to insure rigidity. The arm swings out to the front or rear so that work may be placed on the floor at either side where it is of large size. The arm may be locked in position by means of a clamping screw which locks both the top and bottom of the arm by means of eccentric clamps. The handwheel for moving the head along the arm is located at the left of the spindle convenient to the operator's left hand. The distance from the face of the arm to the spindle is 1⅞ in. so that torsional stresses in the arm are not large. The feed is by means of the hand lever at the right of the spindle, the lever

being connected to the spindle through a ratchet which is disengaged when the feed lever is thrown back to a vertical position. When in this condition the spindle may be quickly brought to the desired position by means of the handwheel at the right, which may also be used for feeding small drills. The drive is through a pair of rawhide and steel bevel gears to the central shaft located inside of the column. The tapping attachment is located in the column and is operated by means of the hand lever at the front of the column which operates a double Johnson friction clutch. All essential bearings are double-row, self-aligning SKF. When required the machines can be furnished with a base having T-slots, and with this type of machine a table is provided that may be easily swung out of the way so that it will not interfere with handling large castings. Machines may be furnished either with or without tapping attachment as may be desired and are also furnished either for belt or motor drive.



HIGH-SPEED, RADIAL DRILLING MACHINE

Spindle speed, 250 to 12,000 r.m.p.; capacity, up to ¾-in. high-speed drills; drills to center of 72-in. circle; working surface of table, 20 x 33 in.; working surface of table side, 5 x 33 in.; vertical movement of table, 16½ in.; vertical movement of spindle, 8 in.; traverse of head on arm, 34 in.; taper hole in spindle, Morse No. 2; weight, 1825 lb.

Cleveland No. 2 Milling Machine

The Cleveland Milling Machine Co., 18511-17 Euclid Ave., Cleveland, Ohio, is now marketing the milling machine shown in the illustration. The base and column are of box section and are cast in one piece from semi-steel. They are ribbed both vertically and horizontally, and the only openings in the column are those necessary for the change-gear levers at the front, the pulley-drive housing in the rear and the cutter-lubricant tank on the left side of the machine. All working parts inside of the column are automatically lubricated and all adjustments on bearings may be made from the outside. The dovetail knee slide extends upward to the overarm in order to provide ample surface for clamping attachments in place. The base of the machine is pan shaped, being deep enough to catch oil and chips, and is finished on the under side so that it will stand solidly on a flat foundation. The knee is secured to the column by means of an improved dovetail slide, the bearing being carried well above the top of the saddle slide and giving a longer bearing on the column. The feed box and knee are entirely inclosed, thus eliminating any possibility of chips getting into the feed mechanism inside of the knee. The elevating screw is of one piece. The customary telescopic screw has been eliminated by the use of a post which acts both as a support to the elevating nut and a guide in the knee. The screw is operated by a double bevel gear and hand and power feed are independent of one another.

The table is machined all over and the bearings are at the top of the saddle instead of at the bottom of the dovetail. This method is claimed to provide a larger bearing surface and also to locate the bearings at greater distances apart. The bearings are automatically lubricated by rollers in the saddle. The bearing on the saddle is also at its widest portion and both the saddle and table bearings are fitted with taper gibs provided with adjusting screws at both ends. The overarm is square, and this shape is claimed to provide positive alignment of the arbors and maximum rigidity of the arm pendants. The square overarm also enables work to be placed on the table and fed in a vertical position past the overarm. The spindle is flanged, which eliminates overhang on the end and prevents trouble caused by cutters screwing fast on the spindle. It also allows cutters to be driven in either direction. On the spindle is a face keyway inserted into which are hard-

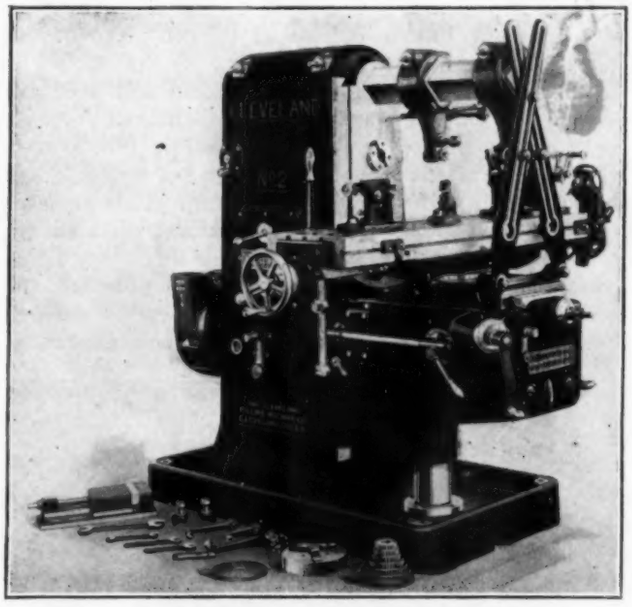


FIG. 1. CLEVELAND NO. 2 MILLING MACHINE

Drive, constant speed; column, one piece with base; overarm, square; changes of feed and speed, 16 in geometrical progression and obtained through sliding gears; bearings, bronze; lubrication, automatic

ened-steel jaws for driving arbors as well as face mills. It is unnecessary to remove these at any time to change from a face mill to an arbor as the driving is done by the steel jaw. By this means the driving strain is taken off the taper hole when the arbors are being used. The spindle is provided with a positive lock to enable the operator to loosen arbor nuts and is also provided with a steel handwheel for revolving the spindle. The

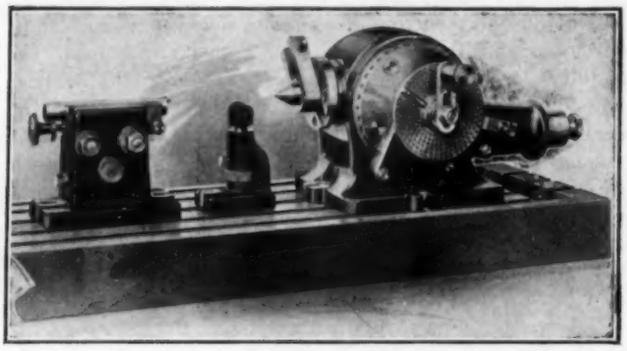


FIG. 2. THE NEW DIVIDING HEAD OF THE CLEVELAND MILLING MACHINE

spindle lock cannot be operated while the machine is running nor can the main driving clutch be thrown in while the spindle lock is in position. The bearings on both the front and rear end of the spindle are taken up with a nut on the outside at the back end of the spindle.

All bearings and gears in the column and knee are flooded with oil. This system is automatic and prevents the necessity of frequent oiling. Cooling lubricant is circulated by means of a centrifugal pump, which is only in motion while the spindle is turning. This obviates the necessity of shutting off the lubricant when changing or measuring work.

Sixteen changes of speed and feed are provided, the speeds being available in either direction as desired. The speeds and feeds are arranged in geometrical ratio,

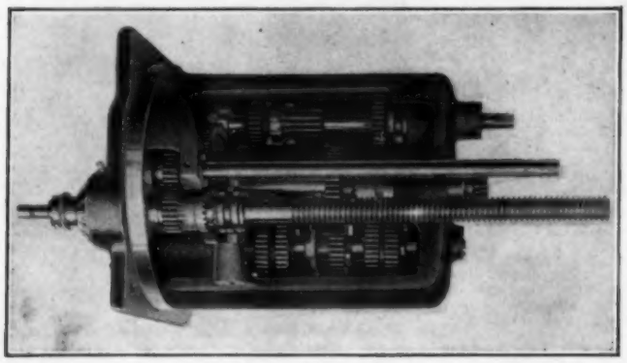


FIG. 3. THE FEED-BOX REMOVED FROM THE MACHINE

and all gears and shafts in the drive are of hardened steel running in bronze bearings and are automatically lubricated while running.

The power is transmitted through a constant-speed drive pulley, no loose gears being required on the spindle. All shifting of gears is done on secondary shafts below the spindle and tumbler gears in the main drive and feed works have been eliminated. The starting or stopping lever can be operated from either side of the machine and the single pulley is protected by means of a belt guard so constructed that it can be adjusted to any angle and extensions can be added to it if desired. The spindle reverse is contained within the machine so that either right- or left-hand cutters may be used. All of the speeds, feeds and other driving mechanism are self-contained within the machine, it not being necessary to have any driving mechanism bolted on the outside of the column or knee. Fig. 1 shows the complete machine, Fig. 2 the new dividing head and Fig. 3 the feed box removed from the machine to show the inside constructior

Reno-Kaetker "Reliance" Swing Saw

The illustration shows a new motor-driven swing saw that has recently been placed on the market by the Reno-Kaetker Electric Co., 41 Main St., Cincinnati, Ohio. This machine is of much heavier construction

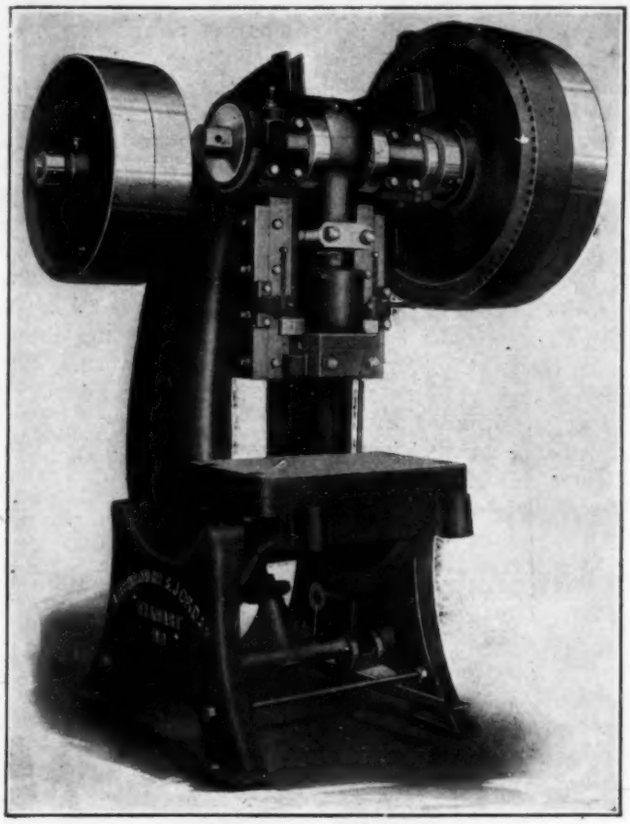
RELIANCE SWING SAW

than like machines formerly manufactured by this company, being particularly adapted for heavy work such as is encountered in shipyards and like places. It is said to be equipped with a heavy saw frame and extra large bearings and uses saw blades from 36 to 42 in. in diameter. The motor is 10 hp.

Loshbough-Jordan No. 5 Open-Back, Inclinable Power Press

The Loshbough-Jordan Tool & Machine Co., Reen St. and Sterling Ave., Elkhart, Ind., has recently added a new press to its line. This is known as the No. 5 open-back, inclinable power press. It is made in either the plain flywheel, back-geared or combination-geared type, as desired, and is claimed to be particularly rigid and simple in construction with well-proportioned frame and

equipped with unusually large bearings. The flywheel is provided with a removable bushing, and a three-point contact is used in the wheel for the clutch pin, with tool-steel striking pins. A large grease cavity in the hub provides for self-oiling. A self-adjusting brake is used, and the toggle control of the trip latch is claimed to provide a positive lock, which prevents operation until the machine is tripped with the foot. Wick oilers are used and bearing caps are provided. The slide is adjusted by means of a large one-piece ball and screw connection with a milled hexagon at the lower end to fit the wrench furnished with the press. An adjusting nut takes up any wear on the ball connection. In order to lock the machine while setting dies without removing the belt from the flywheel a safety stop is provided which locks the clutch pin. The slides for the guides are scraped to fit and are claimed to be exceptionally long. Screw stops are provided for the upper knock out. The slide, which may be adjusted from either side, is provided with a square hole in which undersized punch shanks may be clamped. The reclining arrangement is of the worm and wheel type and provisions are made for removable tie rods in case the work being handled is unusually heavy. The upper lugs, which are directly above the main bearings, are open at the front as shown in order to reduce the time required for applying and removing the rods.



LOSHBOUGH-JORDAN NO. 5 POWER PRESS

Weight complete, 4200 lb.; weight of flywheel, 775 lb.; size of flywheel, 36 x 6 in.; speed of flywheel, 100 r.p.m.; round opening in bed, 14 in. in diameter; oblong opening in bed, 10 x 14 in.; opening through back, 14 in.; depth of throat, 9 in.; die space on top of bolster plate, with stroke down, adjustment up, 7 in.; distance from bed to gibs, 12 in.; standard stroke, 3 in.; maximum stroke furnished on special order, 4½ in.; adjustment of slides, 3 in.; thickness of bolster plate, 2¾ in.; square hole in slide for punch-holder shanks, 2½ in.; floor space 44 x 46 in.; bolster plate, 17½ in. front to back and 29 in. from side to side; face of slide, 9½ in. square

Field Artillery Officers' Training School At Camp Zachary Taylor

A Field Artillery Central Officers' Training School for civilians between 20 years and 8 months and 40 years of age and enlisted men of the army has been established at Camp Zachary Taylor, about six miles from Louisville, Ky. The course will be about 12 weeks, and new classes will start from time to time as the needs of the service and the number of approved applicants demand. This will be hereafter the only training school in the United States for candidates for commissions in the Field Artillery, which includes heavy- and light-horsed and motorized artillery.

Civilians entering the school must agree to serve in the army for the period of the war if they fail to receive commissions, those within the draft age by voluntary induction and those above the draft age by voluntary enlistment. They will be kept in a separate organization for quarantine and preliminary training for about a month after induction or enlistment. Thus the course for civilians will be virtually four months.

Enlisted men sent to the school from various organizations throughout the country, as described hereafter, will immediately enter the school upon their arrival. Both enlisted men and civilians, after entering the school, will be relieved from time to time if they demonstrate unfitness to be officers and will be transferred to other organizations. Candidates who successfully complete the course will be either commissioned second lieutenants immediately upon graduation or designated officer candidates and sent to replacement depots where their education and training will be continued and where they will be given practical experience in drilling, training recruits and handling men.

As the needs of the service demands, the officer candidates not commissioned immediately upon graduation will be commissioned second lieutenants from replacement depots, according to ability and qualifications; thereafter promotion to higher grades will be by selection.

Character and Qualifications

The Field Artillery is in urgent need of a large number of officers. The object of this school is to train a body of men to fill the more responsible positions of command in the Field Artillery, and effort will be made to select men of exceptional character and ability. While it is desired to give an opportunity to all eligible citizens no man should apply whose record is not in every respect above reproach and who has not the fundamental characteristics to inspire respect and confidence.

Officers who have had a scientific and technical education are also needed, but this is not necessary to the selection of candidates. It is essential, however, that every candidate should now have, or be fitted through previous study to reacquire at the school, a thorough understanding and working knowledge of arithmetic and algebra, including quadratic equations and plane geometry. Civilians must be graduates of a high school or must have pursued an equivalent course of instruction. A knowledge of trigonometry to include solution of triangles and logarithms is desirable.

Candidates must be citizens of the United States. No one is eligible who was born in a country with which the United States is at war or of the allies of such a country unless he emigrated to this country before reaching the age of five years. Older men of mature judgment gained through experience in business and professional life are especially desired. Such men need not hesitate to enter this school because on graduation they cannot be commissioned above second lieutenants as promotion will be by selection and should be rapid if they show ability.

Enlisted men of all branches of the Regular Army, National Army and National Guard, except the Coast Artillery Corps, Signal Corps and labor units, are eligible, but must possess the above qualifications for civilians and in addition be recommended through the commanders of the divisions, departments, depot brigades or camps to which they belong.

Manner of Application

All civilians making application to attend the school are required to fill out a blank form provided for the purpose in which they agree to enlist for the duration of the war, if over draft age, or be voluntarily inducted if within draft age and to report at this school when ordered by these headquarters.

After filling out these forms both classes of civilians will be examined by a reputable physician at their own expense or by an army medical officer, whose report will be entered on the application. A second examination will be required before entering the school unless this preliminary examination was made by an army medical officer. Thereupon the application will be forwarded by the applicant to the nearest officer on duty as professor of military science and tactics or any other agency designated on the list, together with three testimonials from reputable persons as to good character.

As soon as possible thereafter the applicants will be notified to appear at his own expense before the professor of military science and tactics or other authorized agency for examination as to his qualifications to attend the school. He will be rated and his applications will be forwarded, together with a recommendation, to the school. Applications received at the school from such examining agencies will be reviewed and approved or rejected, and applicants will be notified from these headquarters of the action taken.

Approved applicants above the draft age will be required to report at the school for enlistment immediately upon receipt of subsequent notification to do so, but will receive reasonable prior notice. Approved applicants within the draft age will be required at a subsequent date to appear before their local board within 24 hours after receipt of summons from said board, and agree to accept or refuse individual induction. If they accept they will be inducted into the service and sent to the school within seven days. Enlisted men are required to make application to attend the school through their division, department, depot brigade or camp commanders, and will be ordered to the school from time to time when called for by these headquarters.

Civilians while at this school will receive the pay of first-class privates, $33 a month. Upon graduation as officer candidates they will be appointed to the grade of sergeant and receive $38 a month. While at the school, and after successfully graduating as officer candidates, food, clothing, bedding, etc., will be furnished. A man with a wife must allot not less than $15 a month to her. To this the Government adds $15 if childless; $25 if there be one child; $32 if there be two children, and $5 a month for each additional child.

Men within the draft age will be sent to the school at the Government's expense. Those above the draft age will be required to travel to the school at their own expense, but will be reimbursed to the extent of 3½c. a mile. When commissioned second lieutenants they will receive $141.67 a month and allotments will automatically cease. Quarters are furnished officers, but not for their families. Married second lieutenants, in addition to the above, will receive commutation of quarters amounting to $24 a month, making their total compensation $165.67 a month. Officers are required to pay for food and clothing.

Upon entering the school candidates will not be allowed to keep in the barracks any luggage but a handbag or a barracks bag. They should not bring trunks with them. Civilian clothing may not be worn at the school, and will have to be sent home after arrival or otherwise disposed of.

All applications should be addressed to Field Artillery Central Officers' Training School, Camp Zachary Taylor, Louisville, Ky.

Meeting of Electric Hoist Manufacturers' Association

The Electric Hoist Manufacturers' Association held its June meeting at Montour Falls, N. Y., where the members of the association were the guests of the Shepard Electric Crane and Hoist Co. Members were present representing the following companies: The Brown Hoisting Machinery Co., Cleveland, Ohio; the Detroit Hoist and Machine Co., Detroit, Mich.; the Euclid Crane and Hoist Co., Euclid, Ohio; the Link-Belt Co., Nicetown, Penn.; the Roeper Crane and Hoist Works, Reading, Penn.; the Shepard Electric Crane and Hoist Co., Montour Falls, N. Y.; the Sprague Electric Works, New York; the Yale and Towne Manufacturing Co., New York.

The general topic of the meeting was war service, and the discussion was directed along lines for coördinating the experience and facilities of the electric-hoist manufacturers to be of the most direct and efficient service to the Government for war requirements. The electric-hoist manufacturers are heavily booked up on Government orders for war purposes and the problem of securing raw material sufficiently in advance to promptly meet Government requirements has become a critical one.

The most instructing and interesting event of the meeting was a detailed inspection of the plant of the Shepard Electric Crane and Hoist Co., covering design, manufacturing, shop costs, testing, technical history of installations and welfare work.

The members were impressed by the frank and open manner in which the officials of the Shepard Electric Crane and Hoist Co. opened the entire plant to the visiting competitors.

LATEST ADVICES FROM OUR WASHINGTON EDITOR

Washington, D. C., July 27, 1918—There is a general feeling of satisfaction in many quarters over the appointment of Gen. C. C. Williams as the Chief of Ordnance instead of having an "acting" chief as was the case during the past year. This also carries his promotion to a major general. With General Williams at the helm here and General Wheeler looking after things in France we can be assured of genuine coöperation in matters pertaining to ordnance activity resulting in a settled policy, which is reassuring in every way. We must not forget, however, that this is not the day of miracles—that we cannot produce big guns overnight when no provision had been made for the machines with which they must be built. In many lines, nevertheless, there is every sign of improvement, and I hope in the not too distant future to be able to give some very definite information showing that the huge organization which has been gathered from the four corners of the country is beginning to function satisfactorily.

I hear occasionally on railroad trains and elsewhere about officers in Washington loafing on their jobs and not doing their work. I presume this may be true in some cases, for I never knew a large organization of any kind where things of this sort did not occur. One is bound to get a certain percentage of misfits in any business, with a percentage of loafers thrown in for good measure.

But I also want everyone to remember and to appreciate that there are hundreds of good men on the job who have sacrificed several thousand dollars a year and who are working harder than most of their critics. In many cases at least they might be at home earning very large profits on war orders, but they felt that duty lay in the work they are pursuing.

Generally speaking, the personnel of the Ordnance Department at present compares favorably with any organization I know of, and it is a pleasure to meet men who can handle work under difficulties in the way many of them are doing it at the present time.

We are also straightening out a lot of the kinks which have existed. Contracts for all departments are to go through one central bureau; contracts with agents are taboo except in cases of emergency, and the whole matter is getting down to a business basis.

One of the difficulties may be shown by the warning which it has been necessary to issue against the reselling of steel obtained by priority orders. As long as practices of this kind are resorted to by manufacturers we can hardly hope for a smooth-running machine in Washington. Warnings have been issued that firms indulging in this practice will not receive preferential assistance in future. There may of course be cases where a firm can help out another temporarily by lending steel. But where more is obtained on priority orders than is needed and then resold, at a profit of course, there is little excuse to be made. The importance of the National War Labor Board, which I have mentioned in previous letters, bids fair to be better understood as the result of its recent refusal to hear an appeal from a group of employers concerning the board's decision in a controversy with their employees. In this case the men accepted the decision without question, but the employers refused to abide by the award and also refused to meet with representatives of the men to develop a plan whereby the award might be put into effect.

Upon hearing the report, Loyal A. Osborne, vice president of the Westinghouse Electric and Manufacturing Co., made the following motion which was unanimously adopted: "It is the sense of the National War Labor Board that inasmuch as the manufacturers agreed to abide by the decision of the board, and the decision having been made, we expect it to be put into effect. We are not willing to give any further hearing in the matter pending the putting into operation of the decision."

It is very clear that we must give up, at least for the duration of the war, many of our former ideas and prejudices in regard to shop management and the rate

General Pershing Wants Foremen

HERE is a chance for a few first-class machine-shop foremen who can handle emergency work under trying conditions. General Pershing wants 150 men of this type over draft age and under 40 who can handle men in various kinds of difficult work, sometimes near the front, sometimes near the base shops—but there will always be plenty to do. The commissions will range from second lieutenant to captain, according to ability. Applications should be sent to C. W. Jones, Room 596, State, War and Navy Building, Washington.

of wages to be paid. The only way to secure results, however, is to coöperate to the fullest extent whether it agrees with our personal ideas or not. We must all play the game, and as the National War Labor Board is the umpire we must abide by its decision.

Much interest is shown concerning the plans which are under consideration for preventing the stealing of labor and its unnecessary transfer from one section of the country to the other. The main feature of the new plan is the United States Employment Service, which is already in operation and is, of course, being extended as rapidly as possible, for this is a tremendous task when it comes to covering the whole country. In addition to this the question of the standardized wage is also being considered, this seeming to be the only way any sort of a stabilized condition can be brought about.

Employers Looking Forward

Most employers are looking forward to this new era with mingled hope and fear, all recognizing the necessity for some such step, but at the same time realizing the great difficulty of putting such a plan into effect. Even with the best of intentions it is found to be very hard to secure a sufficient number of men who have the necessary qualifications for handling work of this kind, and, in common with all movements of this nature, the Employment Service is sure to be saddled with large numbers of men who have little or no vision for the new order of things and who are almost sure to play favorites on either one side or the other.

Needless to say, men of this kind must be weeded out, but as this will take time we must try to be patient while the process is going on. Every manufacturer should keep a concise and unbiased record of his experiences with the new employment service so as to be able to offer concrete suggestions for improvements, to point out flagrant violations of the intentions of the service, and to help in every way to make it all that it was intended to be.

Plan Dependent Upon Coöperation

It should also be remembered that every employer who attempts to secure special service by any means except open-and-above-board coöperation with these new employment offices is helping to disrupt the service and make it impossible for it to perform its proper function. The working out of this plan depends upon thorough coöperation among all concerned, and we must never lose sight of the fact that it is the production of the country as a whole which counts far more than the production secured by any individual concern.

We should bear in mind the resolution of the War Labor Policies Board so that we may help secure the desired results, and in order to keep this freshly in mind I shall quote the entire resolution for the benefit of those who desire to know exactly how this matter stands:

Whereas, The War Labor Policies Board was appointed to establish harmony in those industrial matters on which the governmental departments were agreed that there should be unity of action; and

Whereas, The War Labor Policies Board has now under advisement methods of standardizing wages, hours and conditions of labor in establishments engaged on war work, and is now with that dispatch compatible with the importance of the interests involved conferring on war-labor policies with representatives of organized labor, of industrial management and of governmental departments and other agencies; therefore be it

Resolved, That the War Labor Policies Board urgently requests the departments and boards represented to refrain from making changes in present standards pending the standardization now under consideration.

War Workers' Buttons

The matter of special buttons for war workers is being carefully considered, and while no definite statement has as yet been made in regard to it there seems to be little doubt as to the adoption of a standard button to be used by all war workers in the United States. This presumably will not interfere with the wearing of the individual button which has been provided by the separate firms, but it is of course highly desirable that some standard button should be provided that may be recognized at a glance.

There is also considerable discussion in respect to having a special button, or some sort of an addition to the regular button, to show that the individual is a steady worker and has been on the job consecutively during certain periods. Just how this will eventually work out it is of course impossible to say at this time. The standardized button is coming, however, as is the standardized wage, and it would seem better to wait for definite information in regard to this rather than to go into the providing of individual buttons at this time. Here, again, hearty coöperation is the surest way to secure the desired results.

"Blending" Emery

By Frank Sommers

The other day I paid a visit to one of our big plants engaged on marine work, and while passing through a section busily engaged in grinding valves I heard this:

Boss—Say, my man, that No. 60 emery you're using for grinding in those valves is much too coarse. You should use No. 90.

Man—Can't help it, boss; that's the nearest we got to No. 90. The next best we got is No. 120, and that's too fine.

Boss—Just the thing! Mix her up half and half of No. 60 and No. 120 and that will give you No. 90. It's a wonder you fellows don't use your brains once in a while!

I resumed my journey, deeply immersed in thought.

Nominations for A. S. M. E. Officers

Prof. Mortimer E. Cooley of the University of Michigan, Ann Arbor, Mich., has been nominated for president of the American Society of Mechanical Engineers for 1919. F. R. Low, editor of *Power*, New York; Henry B. Sargent, New Haven, Conn., and John A. Stevens, consulting engineer, Lowell, Mass., have been nominated for vice presidents. Charles L. Newcomb, general manager of the Deane Works, Worthington Pump and Machinery Corporation, Holyoke, Mass.; F. O. Wells, president of the Greenfield Tap and Die Corporation, Greenfield, Mass., and Prof. C. R. Richards of the University of Illinois, Urbana, Ill., have been nominated for managers. William H. Wiley of John Wiley & Sons, New York, has been nominated for treasurer.

Training for Soldier Mechanics

By Wingrove Bathon

The War Department Committee on Education and Special Training reports that great success has attended a plan just put into effect to train mechanics in 150 institutions, such as trade schools, technical high schools, colleges, etc., with which is fitted in a course of instruction on the war aims of the United States and those of other countries, including the Teutonic empires, so that the men being trained may be able to fight behind the lines not only with their hands in matters of mechanics but also with their brains knowing what they are fighting for.

The committee is doing two things of great importance at this time, first, creating a Students' Army Training Corps and, second, training mechanics and developing their morale. The work of the Students' Army Training Corps has been previously described. In the work of training mechanics and developing their morale, of which C. R. Dooley is in charge as educational director of special training, the plan is to give enlisted men an eight-weeks' course in training in whatever trade they are best fitted for. Carpenters, bricklayers, gunsmiths, automobile-repair men, sheet-metal workers, etc., are being trained at 150 institutions such as those mentioned. The University of Texas has the largest detachment. Military and technical drill is given, but one of the most remarkable features is the course on war aims, in which professors of history and other instructors in colleges hold a weekly lecture on the aims of the United States in the war; the aims of the Allies; the German, Austrian, Turkish and Bulgarian aims; the forms of Government of those different countries, etc. The purpose is to build up the morale of the men by making it clear to them what they are or will be fighting for, and it is stated in Washington that the course has had that influence.

The War Department has obtained the services of Dr. R. C. McLaurin, president of the Massachusetts Institute of Technology, as educational director for the new army training corps, which is being created under the auspices of the department's Committee on Education and Special Training. This announcement is made in Washington coincident with the statement that the work of the corps is now in full swing, and that three summer camps were opened July 18 for professors and advanced students in colleges who will take part in the students' training corps next fall. Also the committee has called three conferences to formulate detailed regulations under which the army training corps shall be administered.

The three summer camps are established at Plattsburg, N. Y., Fort Sheridan, Ill., and Presidio, Calif. Three thousand men have been enrolled in each for a period of 60 days, the purpose being to instruct members of faculties and students so they may be able to assist in giving military instruction at colleges. The camps are being operated under the direction of the commanders of the different military divisions in which they are located. The schools have been asked to furnish one instructor for each 200 students and one student out of each fifteen. The schools are reporting direct to the commanders of the military division of the army. The camps are reported to be well on the way to having full quotas and to be going well. The students and professors are on active duty as privates enrolled in the army under a special 60-day enlistment, with the pay of privates and expenses for traveling paid, although it is stated that the schools are at liberty to, and do in many cases, pay their instructors out of their own funds.

The conferences called by the committee to formulate detailed regulations under which the army training corps shall be administered will bring together a large number of college men as the guests of the committee. One of the conferences will be held at Presidio, Calif., Aug. 23; another at Fort Sheridan, Aug. 30, and the other at Plattsburg, Sept. 3.

War Industries Regional Representatives

Directors and organizers managing the regional organizations in the 20 regions into which the United States has been divided for the purpose of keeping the Government advised concerning sources of supply and industrial conditions in all parts of the nation are here given:

Region No.	Region	Name
1	Boston	Stuart W. Webb
2	Bridgeport	B. D. Pierce, Jr.
3	New York	William F. Morgan
4	Philadelphia	Ernest T. Trigg
5	Pittsburgh	George S. Oliver
6	Rochester	Esten A. Fletcher
7	Cleveland	William B. McAllister
8	Detroit	A. H. Templeton
9	Chicago	D. E. Felt
10	Cincinnati	Edwin C. Gibbs
11	Baltimore	.....
12	Atlanta	.....
13	Birmingham	T. H. Aldrich
14	Kansas City	F. D. Crabbs
15	St. Louis	Jackson Johnson
16	St. Paul	.....
17	Milwaukee	August H. Vogel
18	Dallas	Louis Lipsitz
19	San Francisco	Frederick J. Koster
20	Seattle	.....

The object of these regional organizations is to furnish the Government with the necessary knowledge of national conditions in providing new resources and converting industries to war work. As the various departments of the Government develop new requirements in the war program they are presented to the business men of the country through these regional organizations, which serve as points of contact between the War Industries Board and the business men.

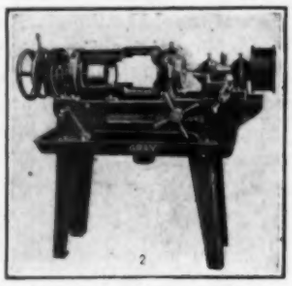
As an indication of what is possible in the conversion of industry to meet war requirements and of the changes which can be made in the product of a factory a few radical instances serve to illustrate. For instance, a Pennsylvania factory that formerly made linoleum is now machining 4.7-in. shells; a Duluth horseshoe manufacturer is turning out trench picks for the army, and a New Jersey terra-cotta-tile concern is making dummy drop bombs; a Milwaukee factory, the former output of which was rowboat motors, is making hand grenades and trench pumps; in Rhode Island a manufacturer of finger rings has turned his activities to making adapter plugs; a Detroit stove concern is producing trench bombs and anchor parts, and a New York shirtwaist manufacturer is making signal flags.

Instances of this sort might be multiplied indefinitely, and they all serve to show the possibilities in converting to war work factories whose normal business has been curtailed by war conditions.

Condensed-Clipping Index of Equipment

Clip, paste on 3 x 5-in. cards and file as desired

Milling Machine, Thread-
Gray Machine Tool Co., Inc., 2661-2665 Main St., Buffalo, N. Y.
"American Machinist," June 27, 1918



Made in three sizes, A, B and C. Size A is for use on 3-in., 75-mm., 4.5-in., 4.7-in. and 5-in. shells; size B for 6-in. and 155-mm. shells and size C for 8-in., 9.2-in., 9.7-in. and 12-in. shells. Specifications for the size A machine are as follows: Weight, 1100 lb.; floor space, 4 ft. 6 in. by 2 ft. 6 in.; work-drive pulley, 8 in. in diameter for 3-in. belt; cutter-drive pulley, 9 in. in diameter for 3½-in. belt; pump-drive pulley, 4 in. in diameter for 1-in. belt. These machines not only thread the shells but face the fuse seat true with the threaded hole. A special feature is the two-speed arrangement allowing the spindle to be driven at two speeds, one for milling and one for facing.

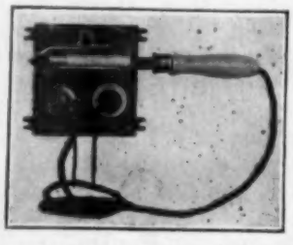
Drawer, All-Steel Bench
New Britain Machine Co., New Britain, Conn.
"American Machinist," July 4, 1918

A hem of triple thickness around the upper edge and the welding of all joints are claimed to produce a drawer of remarkable strength and durability. Another feature is the solid sheet-metal top, which prevents any tampering at the rear and prevents a blocking or locking of the contents as is often the case when a drawer is used on a bench having a thinner back plank than the front one. The slide ways are integral with the top. A cylinder lock and two keys are provided, and master keying for a set of drawers may be incorporated if desired. The drawer is sold as a unit, requiring no fitting, and can be installed without cutting the bench. The inside dimensions are 18 in. long, 16 in. front to back, and 5 in. deep, while the over-all dimensions are 19 in. long, 16½ in. front to back and 5¾ in. deep. Weight in shipping order is 40 lb.

Shell-Washing Machine
Gray Machine Tool Co., Inc., 2661-2665 Main St., Buffalo, N. Y.
"American Machinist," June 27, 1918

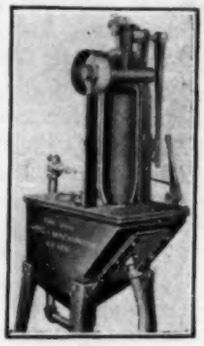
A shell-washing machine that will handle shells 6 in. and smaller in diameter, but can be supplied for larger shells if so ordered. Consists of a cast-iron tank with a rotary pump bolted at the back and piped to two shell cups inside of the cover. Steam pipes for heating the cleaning liquid can be incorporated if desired. The capacity of the tank is approximately 40 gal., and it is divided into two compartments so that the dirt and cuttings remain in the first compartment while the water only can get back into the pump.

Soldering-Iron Rack, Automatic
Cutler-Hammer Manufacturing Co., Milwaukee, Wis., and 144th St. and Southern Blvd., New York City
"American Machinist," July 4, 1918



An automatic rack for supporting and protecting electric soldering irons. The device is so arranged that when the iron is not in use and is placed on the rack, which operates in a similar manner to the hook for a telephone receiver, a resistance is inserted in the circuit of the iron. This reduces the current and prevents the iron from overheating and from burnouts. Another valuable feature is that the iron is kept hot and ready for instant use. The panel is fitted with a push-button snap switch for shutting off the current and with a standard receptable to which the plug of the soldering-iron cord is connected.

Shell-Cleaning Machine
Gray Machine Tool Co., Inc., 2661-2665 Main St., Buffalo, N. Y.
"American Machinist," June 27, 1918



A shell-blast machine which is made in sizes suitable for cleaning 4.5-in., 5-in., 6-in. and 8-in. shells. This is a single-station machine, the shell being placed nose down over the nozzle and revolved while the blast is at work. The capacity of the machine is said to be from 30 to 50 shells an hour and its shipping weight approximately 700 lb.

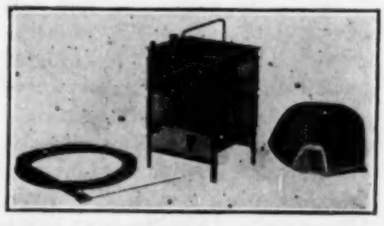
Lathe, Motor-Head Facing, No. 52A
Oliver Machinery Co., Grand Rapids, Mich.
"American Machinist," July 4, 1918

A motor-driven machine for use with alternating current. The spindle is hollow and will accommodate both threaded faceplates and No. 2 Morse taper shanks. The motor is inclosed and claimed to be entirely dustproof. Swing over bracket, 24 in.; swing over rest socket, 20 in.; capacity for work, 20 in. in diameter and 12 in. wide or 24 in. in diameter, 6 in. wide; equipment, 16-in. tool rest with offset rest holder, one right-angle rest, one 6-in. and one 12-in. faceplate, and one 2½-in. screw chuck; diameter of hole through spindle, ½ in.; taper center, No. 2 Morse; speeds variable, 800 to 3500 r.p.m.; weight crated, 675 lb.

Bourrelet Rolling and Knurling Machine, Size A
Gray Machine Tool Co., Inc., 2661-2665 Main St., Buffalo, N. Y.
"American Machinist," June 27, 1918

Designed for knurling the copper band groove on 3-in. and 75-mm. shells. With the two spindles and two knurls, as shown, the machine will double or cross knurl. The machine as ordinarily supplied has but one spindle for a single knurling tool. In operation the shell is placed on the two lower rollers, the base is pushed against the stop, a lever is pulled and the work is done. It is claimed that the machine will knurl 3-in. shells as fast as they can be fed to it. For rolling the bourrelet a rolling tool is placed on the spindle in place of the knurl and a different set of rollers carry the shell.

Welding Apparatus, "Erico" Portable
Electric Railway Improvement Co., Cleveland, Ohio
"American Machinist," July 4, 1918



This apparatus does not require any special power plant, but may be connected to any 110- or 220-volt system in use in the shop for light or power. Its weight is such that it can be picked up in one hand and carried anywhere in the shop. It is made in two sizes, the one shown being for 150 amp. and 110 volts. The device weighs 16½ lb. without the leads and its over-all dimensions are 20½ x 15 x 12 in. The current can be regulated from 15 to 150 amp. in steps of 15 amp. The second outfit is for 150 amp. and 220 volt and weighs 22 lb., the over-all dimensions being 20½ x 19½ x 12 in. Outfits can also be supplied for greater current if desired.

Patent applied for

Personals

Howard K. Moore, office manager of the Whitaker-Glessner Co., Portsmouth, Ohio, has been appointed assistant to the president **Andrew Glass.**

William M. Bailey, formerly secretary to president **A. C. Dinkey** of the Midvale Steel and Ordnance Co., has joined the Federal Shipbuilding Co., Kearny, N. J.

George W. Moore has been appointed assistant general superintendent of the Whitaker-Glessner Co., Portsmouth, Ohio, succeeding **J. M. Smith,** who has resigned.

L. T. Miller, formerly assistant purchasing agent of the Detroit Steel Products Co., has been appointed purchasing agent for the Elgin Motor Car Corportion, succeeding **F. X. Devlin,** resigned.

Henry Cave, until recently director of technical research with the Davis-Bournonville Co., Jersey City, N. J., has assumed the duties of production manager of the SKF Ball Bearing Co., Hartford, Conn.

J. H. Barringer, assistant manager of the foreign department of the National Cash Register Co., Dayton, Ohio, at a recent meeting of the board of directors was appointed assistant manager.

J. B. Wyckoff, who was advertising manager for the Colt-Stratton Co., New York, Dodge Bros. distributor, has resigned. He has been appointed assistant business manager of The Nation's Business, Washington.

S. R. Hunter, formerly affiliated with Fairbanks, Morse & Co., Beloit, Wis., as superintendent of the gas-engine department, has resigned to accept the position of the supervisor of production with the American Rolling Mill Co., Middletown, Ohio.

Capt. Lawrence H. Earle, on duty for the past year as Government inspector at the Holt Works, East Peoria, Ill., has been transferred to Washington as supervisor of tractors and tanks in the Ordnance Deparment. He has been succeeded in East Peoria by **Capt. T. A. Collins.**

N. R. Feltes has been elected treasurer of the Studebaker Corporation, with headquarters at South Bend, Ind., to succeed **C. C. Hanch,** former treasurer, who recently resigned to accept the position of chief of the automotive products division of the War Industries Board in Washington.

H. R. Hyman, for several years advertising manager of the Cole Motor Car Co., Indianapolis, has been appointed promotion department manager to succeed **J. D. Riker** who resigned recently. Mr. Hyman will continue his duties as advertising manager in addition to the new work.

C. P. Henderson, for the last eight years general sales manager of the Cole Motor Car Co., Indianapolis, has resigned to assume the management of the company's Western sales. **J. E. Roberts,** formerly Western district manager, has been promoted to general sales manager.

F. A. Mansfield, for the last 12 years associated with the export and industrial departments of the Westinghouse Electric and Manufacturing Co., has resigned to become manager of the Pittsburgh office of the Mechanical Appliances Co., manufacturer of motors and generators.

E. W. Beach, president of the Manufacturers' Foundry Co., Waterbury, Conn., and a member of the board of directors and executive committee of the Motor and Accessory Manufacturers' Association, has been appointed to a position in the inspection department of the Bureau of Aircraft Production.

E. W. Trimble, formerly sales representative of the Arnold Co., Chicago, in New York, has been appointed sales representative in the Philadelphia district for the C. W. Hunt Co., New York, and the Northern Engineering Works, Detroit. He has opened an office in the Pennsylvania Building, Philadelphia, under the name of E. W. Trimble & Co.

H. S. Johnson, Western district representative for the automobile-equipment department of the Westinghouse Electric and Manufacturing Co., has resigned and has become associated with the Ansted interests manufacturing the Lexington car and the Teeter engine. He will be located at the plant of the Teeter-Hartley Motor Co., Hagerstown, Md.

Ralph G. Farrell, vice president and general manager Bridgeport Screw Co., Bridgeport, Conn., has been commissioned an ensign in the United States Navy. After his graduation from Sheffield Scientific School, Yale University, in 1914, Mr. Farrell was for some time an employee of the United States Steel Corporation before joining his father, **Willian H. Farrell,** in the management of the Bridgeport Screw Co.

James H. Hughes has been appointed manager of the steel and tube department of the Timken Roller Bearing Co., Canton, Ohio. Mr. Hughes was connected with the Carnegie Steel Co., in Cleveland, for many years. He went to Canton Jan. 1, 1913, as resident representative of the Carnegie Steel Co., the Illinois Steel Co. and the Tennessee Coal, Iron and Railroad Co. His official connection with the Timken company began July 1, 1918.

Obituary

Oscar R. Graham, treasurer of the Singer Manufacturing Co., Elizabeth, N. J., died at his home in that city July 8, aged 73 years. He had been connected with the Singer company 45 years.

Sidney W. Shattuck, metallurgist of the General Motors Co., Flint, Mich., from 1912 to 1916, dropped dead in Denver, Col., June 24, and his body was taken to Flint for burial. Mr. Shattuck was 32 years old. At the time of his death he was manager of the Shattuck Chemical Co., Denver.

John J. Mullaney, New York, representative of the Foster Machine Co., died suddenly at Redlands, Calif., on June 1, 1918. Mr. Mullaney was originally with the Garvin Machine Co., and later represented Macht & Co. in Europe. At one time he was owner and general manager of the Ideal Opening Die Co.

Business Items

The Quickwork Co., St. Mary's, Ohio, successor to H. Collier Smith, manufacturer of plate and sheet-metal-working machinery, has opened an office in the Bourse Building, Philadelphia, Penn.

The Erie Steel Construction Co., Erie, Penn., which is now engaged in building cranes, has appointed the A. D. Granger Co., 13 Park Row, New York, its Eastern representative.

The American Bronze Corporation, Berwyn, Penn., manufacturer of the Non-Gran bearing bronze, has built a large addition to its works. This new plant is of fireproof factory construction and will triple its present capacity. It is being constructed by Crowell, Lundoff & Little, Cleveland, Ohio, and is to be finished on Aug. 1.

The Union Switch and Signal Co., Swissvale, Penn., has recently installed several large steam drop hammers ranging in weight from 2000 lb. to 6000 lb., making a total equipment of 12 steam drop and shaping hammers and 18 board drop hammers. Plans are being prepared for extension of the die room and for increasing facilities for heat treating.

L. Vogelstein & Co., Inc., 42 Broadway, and **Beer, Sondheimer & Co., Inc.,** 61 Broadway, New York, both large German-owned metal concerns, have been taken over by A. Mitchell Palmer, Alien Property Custodian. The assets of the Vogelstein Co. are upward of $9,000,000, and those of the Beer, Sondheimer Co. upward of $5,000,000. The two companies were taken over by Mr. Palmer as the result of investigations conducted by Francis P. Garvan, Director of the Bureau of Investigation of the Alien Property Custodian's office. These concerns were closely affiliated with the German Metal Gesellschaft, which for some years has dominated the entire metal market of the world.

New Publications

Aviation Engines: Their Design, Construction and Repair—By Lieut. Victor W. Page. Five hundred eighty-nine 5½ x 8½-in. pages; two hundred fifty-three illustrations. Published by the Norman W. Henley Publishing Co., 2 West 45th St., New York City. Price $3.

The rapidly increasing interest in the study of aviation, and especially of the highly developed internal-combustion motors that make mechanical flight possible, has created a demand for textbooks suitable for schools and home study which will clearly and concisely explain the workings of the various aircraft motors of foreign and domestic manufacture. The book is written by a man long considered an authority on the subject; the matter is arranged in a logical manner, and all descriptive matter is clearly handled and well illustrated. It should be valuable to anyone desiring to become an aviator or an aviation mechanic. The latest rotary types, such as the Gnome Monosoupape and La Rhone motors, are fully explained, as well as the recently developed V and radial types. The chapters on repair and maintenance are very complete and contain considerable that is new. The various chapters treat of types of aircraft, operating principles, efficiency of motors, engine parts and functions, properties of fuels, ignition systems, friction, cylinder construction, details of pistons, power-plant installation, tools for adjusting and erecting and types of aviation motors. The book has been censored by the Government officials and is as complete as present conditions will allow.

Direct-Current Machinery—By Cyril M. Jansky, Associate Professor of Electrical Engineering, University of Wisconsin. Two hundred eighty-five 6 x 9-in. pages; 214 illustrations. Published by the McGraw-Hill Book Co., 239 West 39th St., New York City. Price $2.50.

This book deals with the theory and operation of direct-current machinery. In his instructional work the author has had to deal with a large number of students of limited mathematical training. With students or readers of this class in mind the text has been prepared, and although it has been found inadvisable to omit mathematics entirely, only the more elementary principles are used, and these merely to make clearer the quantitive relations of the physical quantities involved in the theory of direct-current machinery. In connection with the limited use of mathematics an attempt has been made to explain the principles involved so fully that a reader unable to follow the mathematical solution may still acquire some real understanding of the subject. Starting out with a chapter on fundamental magnetic principles the author takes up in turn electromagnetism, electromagnetic induction, units of measurement, transformation of energy, the continuous-current generator and motor, the magnetic circuit of the direct-current dynamo, armatures, uses of electrical energy, types of dynamos, commutation, operating characteristics of generators, operation of generators, operating characteristics of motors, operation of three-wire systems and selection and installation of dynamos. The text is handled in a clear, logical manner, the book is of convenient size and the paper used is of such a grade as to make the text and the illustrations stand out bright and clear.

Forthcoming Meetings

American Society of Mechanical Engineers. Monthly meeting, second Tuesday. Calvin W. Rice, secretary, 29 West 39th St., New York City.

Boston Branch National Metal Trades' Association. Monthly meeting on first Wednesday of each month. Young's Hotel. Donald H. C. Tullock, Jr., secretary. Room 41, 166 Devonshire St., Boston, Mass.

Engineers' Society of Western Pennsylvania. Monthly meeting, third Tuesday; section meeting, first Tuesday. Elmer K. Hiles, secretary, Oliver Building, Pittsburgh, Penn.

New England Foundrymen's Association. Regular meeting, second Wednesday of each month. Exchange Club, Boston, Mass. Fred F. Stockwell, 205 Broadway, Cambridgeport, Mass.

Philadelphia Foundrymen's Association. Meetings first Wednesday of each month. Manufacturers' Club, Philadelphia, Penn. Howard Evans, secretary, Pier 45, North Philadelphia, Penn.

Providence Engineering Society. Monthly meeting fourth Wednesday of each month. A. E. Thornley, corresponding secretary, P. O. Box 796, Providence, R. I.

Rochester Society of Technical Draftsmen. Monthly meeting, last Thursday. O. L. Angevine, Jr., secretary, 857 Genesee St., Rochester, N. Y.

Superintendents' and Foremen's Club of Cleveland. Monthly meeting, third Saturday. Philip Frankel, secretary, 310 New England Building, Cleveland, Ohio.

Technical League of America. Regular meeting, second Friday of each month. Oscar S. Teale, secretary, 35 Broadway, New York City.

Western Society of Engineers, Chicago, Ill. Regular meetings, first, second, third and fourth Mondays of each month, except July and August. Edgar S. Nethercut, secretary, 1735 Monadnock Block, Chicago, Ill.

WEEKLY PRICE GUIDE OF

IRON AND STEEL

The Government Schedule of steel prices went into effect Sept. 24. Pig iron was set at $33 per ton; pig iron differentials were announced by the American Iron and Steel Institute on Nov. 3. Washington announced sheet and pipe prices on Nov. 5. Warehouse prices have been revised, as shown, by agreement between the War Industries Board and the warehouses; new schedule in effect Nov. 15. Effective Apr. 1, the price of basic iron was fixed at $32, and standard Bessemer at $35.20 at Valley furnace, prices of other irons remaining the same as last quarter.

PIG IRON—Quotations per ton were current as follows at the points and dates indicated:

	Current	One Month Ago	One Year Ago
No. 2 Southern Foundry, Birmingham	$33.00	$33.00	$47.00
No. 2X, New York	34.40	.....	53.00
No. 2 Northern Foundry, Chicago	33.00	37.00	55.00
*Bessemer, Pittsburgh	36.60	37.25	57.95
*Basic, Pittsburgh	32.00	33.95	53.00
No. 2X, Philadelphia	34.40	33.75	54.50
*No. 2, Valley	33.00	33.95	55.00
No. 2 Southern Cincinnati	36.90	35.90	49.90
Basic, Eastern Pennsylvania	32.00	33.75	50.00

*Delivered Pittsburgh; f.o.b. Valley, 95 cents less.

STEEL SHAPES—The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses at the cities named:

	New York			Cleveland		Chicago	
	Current	One Month Ago	One Year Ago	Current	One Year Ago	Current	One Year Ago
Structural shapes	$4.245	$4.195	$5.25	$4.17	$4.50	$4.27	$5.00
Soft steel bars	4.145	4.095	5.00	4.07	5.00	4.17	4.50
Soft steel bar shapes	4.145	4.095	5.00	4.17	4.50	4.17	4.50
Soft steel bands	4.095	.....	.....	.....	.....	.....	.....
Plates, ¼ to 1 in. thick	4.495	4.445	9.00	4.42	8.00	4.52	8.00

BAR IRON—Prices per 100 lb. at the places named are as follows:

	Current	One Year Ago
Pittsburgh, mill	$3.50	$4.75
Warehouse, New York	4.75	4.75
Warehouse, Cleveland	4.10	4.95
Warehouse, Chicago	4.10	4.50

STEEL SHEETS—The following are the prices in cents per pound from jobbers' warehouse at the cities named:

	Pittsburgh, Mill, in Carloads	New York Current	New York One Month Ago	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
*No. 28 black	5.00	6.495	6.445	10.50	6.42	9.50	6.52	9.50
*No. 26 black	4.90	6.395	6.345	10.40	6.32	9.40	6.42	9.40
*Nos. 22 and 24 black	4.85	6.345	6.295	10.35	6.27	9.35	6.37	9.35
Nos. 18 and 20 black	4.80	6.295	6.245	10.30	6.22	9.30	6.32	9.30
No. 16 blue annealed	4.45	5.695	5.645	10.20	5.62	9.70	5.72	9.70
No. 14 blue annealed	4.35	5.595	5.545	10.10	5.52	9.60	5.62	9.60
No. 10 blue annealed	4.25	5.495	5.445	10.00	5.42	9.50	5.52	9.50
*No. 28 galvanized	6.25	7.745	7.695	13.00	7.67	11.00	7.77	11.00
*No. 26 galvanized	5.95	7.445	7.395	12.70	7.37	10.70	7.32	10.70
No. 24 galvanized	5.80	7.295	7.245	12.55	7.22	10.55	7.47	10.55

*For painted corrugated sheets add 30c. per 100 lb. for 25 to 28 gage; 25c. for 19 to 24 gages; for galvanized corrugated sheets add 5c., all gages.

COLD DRAWN STEEL SHAFTING—From warehouse to consumers requiring at least 1000 lb. of a size (smaller quantities take the standard extras) the following discounts hold:

	Current	One Year Ago
New York	List plus 13%	List plus 25%
Cleveland	List plus 13%	List plus 10%
Chicago	List plus 13%	List plus 10%

DRILL ROD—Discounts from list price are as follows at the places named:

	Extra	Standard
New York	35%	40%
Cleveland	35%	40%
Chicago	35%	40%

SWEDISH (NORWAY) IRON—The average price per 100 lb., in ton lots, is:

	Current	One Year Ago
New York	$15.50–19	$14.00
Cleveland	20.00	12.30
Chicago	19.00	12.00

In coils an advance of 50c. usually is charged.

Note—Stock very scarce generally.

WELDING MATERIAL (SWEDISH)—Prices are as follows in cents per pound f.o.b. New York, in 100-lb. lots and over:

Welding Wire*		Cast-Iron Welding Rods	
5/16, 1/4, 3/16, 1/8, 5/32, No. 7, 8 and 9	22.10 to 33.00	1/4 by 12 in. long	16.00
No. 10		1/4 by 19 in. long	14.00
No. 12		5/16 by 19 in. long	12.00
No. 14 and 1/16		3/8 by 21 in. long	12.00
No. 16		*Special Welding Wire	
No. 20		1/8	33.00
		1/16	30.00
		3/32	38.00

†Very scarce.

MISCELLANEOUS STEEL—The following quotations in cents per pound are from warehouse at the places named:

	New York Current	Cleveland Current	Chicago Current
Tire	4.15	4.07	4.17
Toe calk	5.75	4.57	4.32
Openhearth spring steel (heavy)	8.00	8.00	7.60
Spring steel (light)	11.00	11.25	11.90
Coppered bessemer rods	9.00	8.00	7.07
Hoop steel	4.99½	4.75	5.02
Cold-rolled strip steel	8.50	8.25	8.57
Floor plates	6.50	6.00	7.07

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh; basing card of Nov. 6, 1917, for steel pipe and for iron pipe:

BUTT WELD

Steel			Iron	
Inches	Black	Galvanized	Inches	Black / Galvanized
⅛, ¼ and ⅜	44%	17½%	¾ to 1½	33% / 17%
½	48%	33½%		
¾ to 3	51%	37½%		

LAP WELD

2	44%	31½%	2	26%	12%
2½ to 6	47%	34½%	2½ to 4	28%	15%
			4½ to 6	28%	15%

BUTT WELD, EXTRA STRONG PLAIN ENDS

⅛, ¼ and ⅜	40%	22½%	¾ to 1½	33%	18%
½	45%	32½%			
¾ to 1½	49%	36½%			

LAP WELD, EXTRA STRONG PLAIN ENDS

2	42%	30½%	2	27%	14%
2½ to 4	45%	33½%	2½ to 4	29%	17%
4½ to 6	44%	32½%	4½ to 6	28%	16%

Stock discounts in cities named are as follows:

	New York Black	New York Galvanized	Cleveland Black	Cleveland Galvanized	Chicago Black	Chicago Galvanized
¾ to 3 in. steel butt welded	33%	16%	43%	28%	41.9%	26.9%
3½ to 3 in. steel lap welded	15%	+3%	39%	25%	37.9%	23.9%

Malleable fittings, Class B and C, from New York stock sell at list price. Cast iron, standard sizes, 10 and 5%.

METALS

MISCELLANEOUS METALS—Present and past New York quotations in cents per pound, in carload lots:

	Current	One Month Ago	One Year Ago
Copper, electrolytic	26.00*	23.50	28.00
Tin in 5-ton lots	94.00	85.00	62.50
Lead	8.05	7.25	10.37½
Spelter	8.62½	7.50	8.75

*Government price.

ST. LOUIS

Lead	7.75	7.25	10.12½
Spelter	8.37½	7.10	8.50

At the places named, the following prices in cents per pound prevail, for 1 ton or more:

	New York Current	New York One Month Ago	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Copper sheets, base	38.00	32.50	42.00	38.00	42.00	33.50	42.00
Copper wire (carload lots)	35.00	31.00	47.50	35.00	46.00	33.00	47.00
Brass sheets	39.75	31.75	39.125	37.00	39.50	31.50	39.00
Solder ½ and ½	46.00	36.50	45.00	40.00	38.00	41.50	43.00
Brass pipe base (case lots)	60.00	70.00	39.50	62.00	39.00	70.00	39.00

Note:—Solder very scarce.

Copper sheets quoted above hot rolled 16 oz., cold rolled 14 oz. and heavier, add 1c.; polished takes 1c. per sq.ft. extra for 20-in. widths and under; over 20 in., 2c.

BRASS RODS—The following quotations are for large lots, mill, 100 lb. and over, warehouse; 25% to be added to mill prices for extras; 50% to be added to warehouse price for extras:

	Current	One Year Ago
Mill	$32.25	$42.00
New York	34.25	45.50
Cleveland	35.00	38.00
Chicago	29.50	42.50

ZINC SHEETS—The following prices in cents per pound prevail:

Carload lots f.o.b. mill	15.00

	In Casks Current	In Casks One Year Ago	Broken Lots Current	Broken Lots One Year Ago
Cleveland	18.75	21.00	18.40	21.50
New York	16.50	23.00	17.00	23.25
Chicago	22.00	22.50	21.50	23.50

ANTIMONY—Chinese and Japanese brands in cents per pound, in ton lots, for spot delivery, duty paid:

	Current	One Year Ago
New York	13.25	16.00
Chicago	13.50	18.50
Cleveland	16.00	19.00

SHOP MATERIALS AND SUPPLIES

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

	New York Current	New York One Yr. Ago	Cleveland Current 1918	Cleveland One Yr. Ago	Chicago
Copper, heavy and crucible	23.50	26.50	24.00	24.75	23.50
Copper, heavy and wire	22.50	25.50	23.00	24.75	23.25
Copper, light and bottoms	20.50	23.50	21.00	22.00	22.00
Lead, heavy	7.00	9.00	21.50	9.50	7.85
Lead, tea	5.25	7.00	7.50	7.00	6.50
Brass, heavy	14.75	16.50	6.00	17.00	23.50
Brass, light	11.00	13.00	12.50	12.50	13.00
No. 1 yellow brass turnings	13.00	17.50	14.00	15.00	13.50
Zinc	5.75	6.25	6.50	6.50	6.35

ALUMINUM—The following prices are from warehouse at places named:

	New York	Cleveland	Chicago
No. 1 aluminum, guaranteed over 99% pure, in ingots for remelting (ton lots) per lb.	32.10c.	32.20c.	33½c.

This is the Government price for lots of from 1 to 14 tons.

COPPER BARS from warehouse sell as follows in cents per pound, for ton lots and over:

	Current	One Year Ago
New York	42.00	41.00
Chicago	38.00	41.00
Cleveland	36.50	41.00

BABBITT METAL—Warehouse price per pound:

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Best grade	125.00	70.00	108 00	70.00	100.00	70.00
Commercial	70.00	40.00	23.00	24.50	24.00	25.00

SHOP SUPPLIES

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Hot pressed square	$2.50*	List	$1.40	$1.65	$1.05	$3.00
Hot pressed hexagon	2.50*	List	1.20	1.50	.85	3.00
Cold punched square	2.50*	List	.75	1.40	1.00	1.60
Cold punched hexagon	2.50*	List	.75	1.40	1.00	2.00

* List plus.

Semifinished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	40%	50%
Chicago	50%	50%
Cleveland	60%	50%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
⅝ by 4 in. and smaller	30%	46%	37%
Larger and longer up to 1 in. by 30 in.	15%	40%	25—5%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:
New York ..... $2.50 Cleveland ..... $3.00 Chicago $2.50

For cast-iron washers the base price per 100 lb. is as follows:
New York ..... $5.00 Cleveland ..... $4.00 Chicago $3.50

CARRIAGE BOLTS—From warehouses at the places named the following discounts from list are in effect:

	New York	Cleveland	Chicago
⅝ by 4 in. and smaller	30%	46%	37%
Larger and longer up to 1 in. by 30 in.	15%	40%	25—5%

COPPER RIVETS AND BURS sell at the following rate from warehouse:

	Rivets Current	Rivets One Year Ago	Burs Current	Burs One Year Ago
Cleveland	List plus 10%	List plus 10%	List plus 10%	List plus 10%
Chicago	List price	List price	List plus 20%	List price
New York	20% from list	10-2½% from list	List plus 20%	10-2½% from list

RIVETS—The following quotations are allowed for fair-sized orders from warehouse:

	New York	Cleveland	Chicago
Steel ½ and smaller	30%	45—5%	45%*
Tinned	30%	45—5%	45%*

Button heads, ¾, ⅞, 1 in. diameter by 2 in. to 5 in. sell as follows per 100 lb.
New York..$5.65 Cleveland..$5.15 Chicago..$5.67 Pittsburgh..$4.65

Coneheads, same sizes:
New York..$5.75 Cleveland..$5.25 Chicago..$5.77 Pittsburgh..$4.75

MISCELLANEOUS

SEAMLESS DRAWN TUBING—The base price in cents per pound from warehouse in 100-lb. lots is as follows:

	New York	Cleveland	Chicago
Copper	49.00	42.50	39.50
Brass	40.00	40.00	44.00

For immediate stock shipment 3c. is usually added. The prices of course vary with the quantity purchased. For lots of less than 100 lb. but not less than 75 lb., the advance is 1c.; for lots of less than 75 lb. but not less than 50 lb., the advance is 2½c. over base (100-lb. lots); for less than 50 lb. but not less than 25 lb., 5c. should be added to the base price; and for quantities under 25 lb. the increase above base is 10c.

TIN PLATES—Warehouse prices per box:

Coke tin plate, 14 x 20:

	Cleveland Current	Cleveland One Yr. Ago	Chicago Current	Chicago One Yr. Ago
100 lb.	$10.00	$12.00	$10.60	$11.75
I. C. 107 lb.	10.15	12.17½	10.70	11.90

Terne plate, 20 x 28:

Base Weight	Net Weight	Coating				
100 lb.	200	3	18.95	18.70	19.10	17.00
I. C.	214	8	19.25	19.00	19.40	17.35
I. C.	270	8	21.75	21.50	21.40	19.45
I. C.	218	12	21.75	19.85	22.60	18.35
I. C.	221	15	22.50	20.35	22.10	18.60
I. C.	226	30	23.25	21.75	22.60	19.65
I. C.	231	25	24.50	22.20	23.10	20.40
I. C.	236	30	25.75	23.50	23.60	21.35
I. C.	241	35	26.75	24.50	25.10	23.35
I. C.	246	40	28.00	25.75	25.60	23.65

NOTE—New York prices furnished on application to dealers. Price varies according to whether the plates are wanted for work essential to the war or for nonessential work.

COTTON WASTE—The following prices are in cents per pound:

	New York Current	New York One Year Ago	Cleveland	Chicago
White	11.00 to 13.00	13.00	16.50	12.00 to 16.50
Colored mixed	8.50 to 12.00	10.00	13.00	11.50 to 14.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13¼ x 13¼	13¼ x 20½
Cleveland	52.00	68.00
Chicago	48.00	50.00

SAL SODA sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$1.75	$1.75	$1.75
Philadelphia	1.75	1.75	1.75
Cleveland	2.40	2.35	2.00
Chicago	4.65	2.00	2.00

ROLL SULPHUR in 360-lb. bbl sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$4.30	$4.30	$2.85
Cleveland	4.60	4.50	4.50
Chicago	4.00	4.65	3.00

COKE—The following are prices per net ton at ovens, Connellsville, and cover the past four weeks:

	Aug. 1	July 25	July 17	July 10	July 3	June 27
Prompt furnace	$6.00	$6.00	$6.00	$6.00	$6.00	$6.00
Prompt foundry	7.00	7.00	7.00	7.00	7 00	7.00

FIRE CLAY—The following prices prevail:

		Current
Chicago	450-lb. bbl.	$2.50
Cleveland	375-lb. bag	2.50

LINSEED OIL—These prices are per gallon:

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Yr. Ago
Raw in barrels	$1.88	$1.16	$2.00	$1.20	$1.97	$1.21
5-gal. cans	1.96	1.26	2.15	1.35	2.17	1.36

WHITE AND RED LEAD in 500-lb. lots sell as follows in cents per pound:

	Red Current Dry	Red Current In Oil	Red 1 Year Ago Dry	Red 1 Year Ago In Oil	White Current Dry and In Oil	White 1 Year Ago Dry and In Oil
100-lb. keg	14.00	14.50	13.25	13.50	14.00	13.00
25 and 50-lb. kegs	14.25	14.75	13.50	13.75	14.25	13.25
12½-lb. keg	14.50	15.00	13.75	14.00	14.50	13.50
5-lb. cans	——	——	15.25	15.50	16.00	15.50
1-lb. cans	——	——	——	——	17.00	——

NEW *and* ENLARGED SHOPS

Consult the Buying Section when in need of machinery or supplies

WASHINGTON, D. C.

The Navy aims to give information regarding its purchases to all manufacturers known to be in a position to supply its demand. Owing to the need of prompt action in the cases of all machine tools hereinafter listed, the Navy cannot arrange to permit a postponement of the opening of bids if the manufacturers are able to secure bidding forms and submit their bids prior to date fixed for opening.

In case time does not permit this, it will be appreciated if any manufacturer not receiving information directly regarding these purchases will notify the Purchasing Division, Bureau of Supplies & Accounts, Navy Department, Washington, D. C., in order that the firm's name may be properly listed for all future purchases.

The Bureau of Supplies and Accounts, Navy Department, will soon receive bids for machines and machine tools as follows:

Shapers, Schedule No. 5171½, delivery, Norfolk, Va.

Threading Mill Machine, Schedule No. 5173½, delivery, Newport, R. I.

Cutter and Tool Grinder, Schedule No. 5174½, delivery, Newport, R. I.

Machine Tools, Schedules Nos. 5213½, 5214½, 5215½, 5216½ and 5217½; delivery, Brooklyn, N. Y.

Lathe, Schedule No. 5219½, delivery, Boston, Mass.

Machine Tools, Schedules Nos. 5227½ and 5231½, delivery Newport, R. I.

Machine Tools, Schedule No. 5232½, delivery, Norfolk, Va.

The Bureau of Supplies and Accounts, Navy Department, will receive bids for machines and machine tools as follows:

August 5—Sand Machine, Schedule No. 5163½, delivery Wash., D. C.

Grinding Machine, Schedule No. 5168½, delivery, Philadelphia, Penn.

August 9—Oxycetylene Outfit and Tanks, Schedule No. 5218½, delivery, Brooklyn, N. Y.

August 12—Oil Groving Machine, Schedule No. 5185½, delivery, Newport, R. I.

Machine Tools, Schedule No. 5186½, delivery, Newport, R. I.

Drill Press, Schedule No. 5257½, delivery, New York, N. Y.

Planer, Schedule No. 5269½, delivery, Mare Island, Calif.

August 13—Boring Machine, Schedule No. 5170½, delivery, Norfolk, Va.

August 20—Machine Tools, Schedules Nos. 4986½, 4987½, 4988½, 4989½, 4990½, 4991½, 4992½, 4994½, 4995½, 4996½, 4997½, 4998½; delivery, Navy Yard, Wash., D. C.

The Bureau of Supplies and Accounts, Navy Department, received bids for furnishing machines and machine tools, as follows:

(Item 1a)—240 ft., 2 11/16 in. dia. per ft. shafting; (item 2b)—180 ft., 2 11/16 in. dia. per ft. shafting; (item 3c)—400 ft., 2 11/16 in. dia. per ft. shafting; (item 4d)—400 ft., 2 11/16 in. dia. per ft. shafting; (item 5a)—25 hangers; (item 6b)—30 hangers; (item 7c)—48 hangers; (item 8d)—54 hangers; (item 9a)—20 collars; (item 10b)—20 collars; (item 11c)—40 collars; (item 12d)—40 collars; (items 13a to 16d)—couplings; (items 17a to 20d)—bearings; (items 21 to 24)—pulleys, etc.; Class 763, Schelule No. 5058½, delivery, Brooklyn, N. Y.; from American Pulley Co., 4200 Wessa St., Philadelphia, Penn., $1,643.23, part bid. Chas. Bond Co., 520 Arch St., Philadelphia, Penn., $5649, part bid; Dodge Sales and Engineering Co., 815 Arch St., Philadelphia, Penn., $4653, alternate, $5274, alternate, $5086, part bid; Hyatt Roller Bearing Co., 1 Madison Ave., New York City, $2836; Homer Strong, Ellicott Sq., Rochester, N. Y., $6638; Medart Patent Pulley Co., 3500 DeKalb Ave., St. Louis, Mo., $1422, alternate, $3276, alternate, $3302; Pyott Co., 1401 West North, Chicago, Ill., $4220, part bid; Reeyes Pulley Co., Columbus, Ind., $1150, part bid; Standard Pressed Steel Co., 20th and Clearfield Ave., Philadelphia, Penn., $2629, part bid.

(Item 2)—1 horizontal, boring, drilling and milling machine, of fixed post type, Class 684; (item 1)—6 back geared, constant speed drive, electrically driven, universal milling machines, Class 685, Schedules No. 5001½, delivery, Navy Yard, Wash., D. C., from Niles Bement & Pond, 111 Bway, New York City, (2) $47,485; Brown & Sharpe Manufacturing Co., Providence, R. I., (1) $2292; Fairbanks Co., Colorado Bldg., Wash., D. C., (1) $3655.

(Item 3)—4 belt driven, brass finishing lathes; (Item 3a)—additional leaders and followers for complete range of U. S. Navy standard threads; (Item 3c)—alternate bid "B"—four 9 to 10 in. by 6 ft. bed, screw cutting, speed lathes, with turret attachment and tail stock, Class 473, Schedule No. 4854½, delivery 3 lathes, Navy Yard, Brooklyn, N. Y. and 1 at Philadelphia, Penn., from Smythe Despard Co., 300 Broad St., Utica, N. Y., (3 and 3a) $1,550.40; J. B. Williams & Sons, 9 Orchard St., Dover, N. H., (3 and 3a) $1,618.20; Fairbanks Co., Colorado Bldg., Wash., D. C., alternate "B," $906; Kemp Machine Tool Co., 223 North Calvert St., Baltimore, Md., alternate "B," $850, $1,010; D. Nast Machine Co., Bourse St., Philadelphia, Penn., alternate "B," $498.

(Item 1)—Two 15 in., motor driven, universal shaping machines, Class 474, Schedule No. 4789½, delivery, Navy Yard, Charlestown, Mass., from Hollingsworth Machine Tool Co., Covington, Ky., $1,085; D. Nast Machine Co., Bourse St., Philadelphia, Penn., $1,120, $1,110; Potter & Johnson Machine Co., 1027 Newport Ave., Pawtucket, R. I., $1545; Henry Prentis & Co., Inc., 149 Bway, New York City, $1,990.

(Item 1)—1 motor driven, automatic cup wheel, knife grinding machine, Class 475, Schedule No. 4855½, delivery Navy Yard, Wash., D. C., from J. A. Fay & Egan Co., John and Front St., Cincinnati, Ohio, $619.45, alternate, $694.45, $1,011.20, and $1,086.20; Kemp Machine Co., 223 North Calvert St., Baltimore, Md., $377, $425; Machine Co. of America, Big Rapids, Mich., $425; Manning, Maxwell & Moore, 119 West 40th St., New York City, $328; D. Nast Machine Co., Bourse St., Philadelphia, Penn., $305, alternate, $290, $331, and $316; Swind Machine Co., Widener Bldg., Philadelphia, Penn., $403.

(Item 1)—2 motor driven, band saw, filling and setting machines, Class 477, Schedule No. 4857½, delivery Navy Yard, Wash., D. C., from Black Diamond Saw and Machine Works, Inc., 43 North Ave., Natick, Mass., $95; W. F. Davis Machine Tool Co., 945 Pennsylvania Ave., Wash., D. C., $136.50; J. A. Fay & Egan Co., John and Front St., Cincinnati, Ohio, $137.20; Kemp Machine Co., 223 North Calvert St., Baltimore, Md., $94; Machine Co. of America, Big Rapids, Mich., $258; D. Nast Machine Co., Bourse St., Philadelphia, Penn., $95; Aumen Machine Co., 107 East Lombard St., Baltimore, Md., $138.40.

(Item 1)—Two 36 in. wheel, motor driven, band saws, Class 478, Schedule No. 4858½, delivery Navy Yard, Philadelphia, Penn., from J. A. Fay & Egan Co., John and Front St., Cincinnati, Ohio, $643.16, $593.16; Fairbanks Co., Colorado Bldg., Wash., D. C., $475; Kemp Machine Co., 223 North Calvert St., Baltimore, Md., $309; Monarch Machine Co., 300 North Third St., Philadelphia, Penn., $650; D. Nast Machine Co., Bourse St., Philadelphia, Penn., $440, $481, $373, $415; Swind Machine Co., Widener Bldg., Philadelphia, Penn., $557; J. T. Towsley Manufacturing Co., 1037 Evans St., Cincinnati, Ohio, $800; West Side Iron Works, Grand Rapids, Mich., $622.40, $672.40; Oliver Machine Co., 50 Church St., New York City, $585.

(Item 1)—Two 15 to nelectric traveling cranes, Class 479; (Item 2)—one 5 ton electric traveling crane, Class 480, Schedule No. 4781½, delivery Navy Yard, Mare Island (Vallijo P. O.), Calif., from Bedford Foundry & Machine Co., Bedford, Ind., (1) $6,682.50, (2) $9,200; A. D. Granger Co., 15 Park Row, New York City, (1) $14,300, (2), part bid $5,955; Milwaukee Electric Crane and Manufacturing Co., West Allis, Milwaukee, Wis., (1) $17,000; Manning, Maxwell & Moore, 119 West 40th St., New York City, (1) $15,705, (2), part bid $4,600; Niles, Bement & Pond Co., 111 Bway, New York City, (1) $13,730, (2) $11,930; Rawlings & Harnischfeger Co., Milwaukee, Wis., (1) $17,000, (2) $9,850; Whiting Foundry Equipment Co., Harvey, Ill., (1) $14,727, (2) $11,000; Alfred Box Co., Philadelphia, Penn., (2) $10,660; Cameron Engineering Co., East Stroudsburg, Penn., (2) $8,746.

(Item 1)—1 swing, cutoff, sewing machine, Class 494, Schedule No. 4820, delivery Navy Yard, Wash., D. C., from Defiance Machine Works, Defiance, Ohio, $342; J. A. Fay & Egan Co., John and Front St., Cincinnati, Ohio, $439.40; Hall and Brown Wood Working Machine Co., 1913 North Bway, St. Louis, Mo., $350; Hermance Machine Co., 178 Campbell St., Williamsport, Penn., $279; Kemp Machine Co., 223 North Calvert St., Baltimore, Md., $210; Manning, Maxwell & Moore, 119 West 40th St., New York City, $181; C. O. Porter Machine Co., 666 Front St., N., Grand Rapids, Mich., $290; Reno Kaetkem Electric Co., 501 Gerke Bldg., Cincinnati, Ohio, $350; Oliver Machine Co., 50 Church St., New York City, $446.

(Item 1)—1 sawing and jointing machine, Class 495, Schedule No. 4815½, delivery Naval Operating Base, Hampton Roads, Va., from Kemp Machine Co., 223 North Calvert St., Baltimore, Md., $518; Lane Manufacturing Co., Montpelier, Vt., $250; Manning, Maxwell & Moore, 119 West 40th St., New York City, $302; D. Nast Machine Co., Bourse St., Philadelphia, Penn., $320, $388, $253.

(Item 1)—One 16 in. crank, heavy duty, back geared, motor driven shaper, Class 501; (Item 2)—one 16 in. motor driven, sensitive drill, Class 502, Schedule No. 4813½, delivery Navy Yard, Philadelphia, Penn., from W. F. Davis Machine Tool Co., 945 Pennsylvania Ave., Wash., D. C., (1) $1,317, (2) $345; Fairbanks Co., Colorado Bldg., Wash., D. C., (1) $1,355; Hollingsworth Machine Tool Co., Covington, Ky., (1) $1,085; Manning, Maxwell & Moore, 119 West 40th St., New York City, (1) $1,419, (2) $288; D. Nast Machine Co., Bourse St., Philadelphia, Penn., (1) $1,440, (2) $186; Niles, Bement Pond Co., 111 Bway, New York City, (1) $1,575; W. E. Shipley Machine Co., Morris Bldg., Philadelphia, Penn., (1) $1,550; Swind Machine Co., Widener Bldg., Philadelphia, Penn., (1) $1,510; Sherritt & Stoer Co., Inc., Finance Bldg., Philadelphia, Penn., (1) $1,856, (2) $335; Vandyck Churchhill Co., Bourse St., Philadelphia, Penn., (1) informal; Young, Corley & Dolan, Inc., 115 Bway, New York City, (1) $650 f.o.b.; Hoefer Manufacturing Co., 155 Chicago St., Freeport, Ill., (2) $221; Kemp Machine Co., 223 North Calvert St., Baltimore, Md., (2) $204; Sipp Machine Co., Kenn St. and Erie R.R., Paterson, N. J., (2) $408.

(Item 1)—12 braiding machines, Class 500, Schedule No. 4843½, delivery Navy Yard, Boston, Mass., from New England Butt Co., 304 Pearl St., Providence, R. I., $79.50; E. H. Tate Mop and Cordage Co., $100; Textile Machine Works, Wyomissing, Reading, Penn., $85, $93.06.